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SUPPLEMENT

TO THE

ANNUAL REPORT

OF THE

State Engineer and Surveyor

OF THE

STATE OF NEW YORK

FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1903.

TRANSMITTED TO THE LEGISLATURE JANUARY 15, 1904

ALBANY
OLIVER A. QUAYLE
STATE LEGISLATIVE PRINTER
1904

REPORT

ON THE

Gaugings of Volume of Discharge of Streams

IN THE

STATE OF NEW YORK

1903

REPORT

ON THE

CO-OPERATIVE SURVEY

OF THE

STATE OF NEW YORK

1903

INTRODUCTION.

The following extracts from the Annual Report of the State Engineer and Surveyor of New York, for 1903, relate to those portions of the work of this Department which are done by co-operation between the United States Geological Survey and the New York State Engineer Department:

REPORT ON MEASUREMENT OF THE VOLUME OF STREAMS AND FLOW OF WATER IN THE STATE OF NEW YORK.

(Reprinted from page 89.)

MEASUREMENT OF THE VOLUME OF STREAMS AND FLOW OF WATER IN THE STATE OF NEW YORK.

There is an increasing desire to develop the many water powers throughout the State and a growing demand for increased water supplies for the great cities, with the result that the State Engineer receives many requests for the records of measurements of the volumes of streams and of the flow of water. The approval which this new work of the State has received during the past two years has confirmed the wisdom of the Legislature of 1900, when it first made the appropriation for this work and enacted the following quoted law:

> *The People of the State of New York, represented in Senate and Assembly, do enact as follows:*
>
> The treasurer shall pay on the warrant of the comptroller, for the state engineer and surveyor, one thousand dollars to be used with the United States geological survey in hydrographic work connected with the measurements of the volume of streams and flow of water in the State of New York.

This act became a law April 13, 1900, and the results have received a public approval so general that the subsequent Legislatures have slightly increased the amount to $1,500 per year which sum has been equalled or exceeded each year by the U. S. Geological Survey, which, during 1903, contributed three times the amount supplied by the State, and the whole has been applied to the measurements of those streams of which the records were most needed, extending the field of operations wherever this could be done within the limits of the very small amount available..

This law is similar in its provisions and in its effect to existing laws in other States, and it has enabled the State Engineer to arrange a system of cooperation with the U. S. Geological Survey by which the State has the full benefit of the experienced and skilled observers of that Department and of the accurate instruments and methods, and thus obtains, at a merely nominal cost, much desired information which increases in value by its continuance from year to year.

New stations have been added wherever possible and records have been obtained from voluntary observers connected with manufactories on the various rivers who appreciate the value of having their records studied and collated by skilled hydrographers by whose work they are thus enabled to profit. Where paid observers are necessary, they usually read the gauges twice a day and record the readings and also the depth and the extent of ice on streams in the vicinity and report them once a month to the central office; for which service they receive an average of $3.47 a month each.

A record of these gauge readings makes it possible to determine the mean volume of water passing it day by day, by means of current-meter measurements which are occasionally made by a skilled observer, who visits each station for a few hours at a time when the stream is at various heights and thus determines the amount of water passing from different heights of the gauge-reading, the discharge of the stream being fairly constant for a given height on the gauge and increasing in more or less regular ratio as the water-level rises. There is thus constructed for each stream a table showing the amount of water passing for any given height and there is thus obtained a complete record of the flow of the stream. Gauges are so located that the meter observations can be made from a bridge spanning the stream whenever satisfactory conditions and regular flow are found, but such gauge locations are avoided if the flow is much disturbed by bridge-piers which sometimes make accurate records impossible. In some cases (as on the Oswego River, eight miles from Lake Ontario, and on the Moose River) a fixed wire cable is stretched across the stream well above water level, and the observer makes meter readings in a car in which he travels upon this cable.

It is intended to establish these meter-gauges upon streams where it is practicable and to gradually discontinue observations at dams where the conditions are unsatisfactory.

With the records obtained during 1903 there have also been collected certain heretofore unpublished former records of the same streams, and the results are here given in tables showing the daily mean flow, and also hydrographs which gives the same information graphically and which show at a glance the periods of high water and of low water and the regular or erratic character of the flow of the various streams, which differ widely with the varied nature of their watersheds.

Uniform hydrographs will be found representing the flow of streams which, like the Oswego River, have their headwaters in systems of lakes which affect the natural regulation of their flow and which prevent extremes of either high-water or low-water. Irregular hydrographs show the flow of streams having, like the Mohawk River, sudden and extreme variations due to a quick run-off from the cultivated hillsides which form their watersheds.

The tables give the daily means of flow in more detailed form, and such photographs are given as are necessary to show the varied conditions existing at the various stations.

There are in New York State a great many undeveloped water powers which are likely to be brought into use by the present possibilities of electrical development and long-distance transmission. Such a case is described in detail at page 153 of the 1902 supplement, as being an interesting illustration of what can be done in this way on a comparatively small scale, and by which a stream which has formerly gone to waste has recently been made to produce about 1,000 horse power of electrical energy which the enterprising owner distributes to a number of towns in the vicinity.

The gratifying results which have been obtained by the co-operative system of stream measurements, are largely due to the effective attention and efforts of Mr. F. H. Newell, Chief Hydrographer of the U. S. Geological Survey at Washington, and of Prof. Henry A. Pressey, who has had general charge of this portion of their operations, and also to Mr. Robert E. Horton, who is in local charge in this State, and whose detailed report with the photographs and tables which show the results, is appended.

The value of these records is such as to show that the system should be still further extended and should be made to include many other important streams in different parts of the State regarding which inquiries have repeatedly been made, and the appropriation of $3,000 is recommended for this purpose, although a larger sum could be used to great advantage.

SURVEY OF THE STATE IN CO-OPERATION WITH THE UNITED STATES GEOLOGICAL SURVEY. (Reprinted from page 81.)

This work of co-operation was begun in 1892 and has since been continued by annual appropriations by the State, for the payment of one-half of the cost of the field work of the survey, the last being for $20,000.

Close attention has been given and close examination made of the merits of this system of co-operation and of the character of the work which is done under it, and it is found that the State is getting a fine class of work at a comparatively low cost. The maps which are produced are of great value to the State in many ways; especially in connection with the work of highway improvement in different parts of the State and with the operation of the Forest Preserve Board in the portion covered by the maps, and in the examination of water-supplies for existing and proposed canals and for the great cities. A proof of each sheet is sent to this office from Washington for examination and approval before being finally published, and in this way judgment is made as to the character of the work and in some cases valuable additions are thus made.

The sheets composing the topographic atlas are designated by the name of a principal town or of some prominent feature within the district, and the names of adjoining published sheets are printed on the margins. By an arrangement beginning in 1904, each present and prospective sheet of New York State has been given a fixed number which is printed in black in the upper left-hand corner of each quadrangle, there being 260 numbers as shown on the progress-map accompanying this report. For convenience of reference, and in order to have full benefit of this arrangement, each person having a file of these sheets can use a set of Dennison's adhesive consecutive numbers, style 20, of which numbers from 1 to 300 can be had for 24 cents from any dealer in stationery, and which can be put on the sheets to correspond with the number on the progress-map here published. This progress-map can be obtained free by application to the State Engineer, Albany, N. Y.

The maps are published on a scale of about one inch to the mile, in sheets of which about 244 will cover the whole State; each sheet showing about twelve miles east to west by eighteen miles north to south, including sheets which show parts of adjoining States and including special sheets, there are to be 260 sheets in all. One hundred and forty-nine of these sheets have been completed and published and are for sale by the United States Geological Survey at the nominal price of five cents each, or $2 per hundred, the engraving and publishing being done entirely at the expense of the United States government. Nineteen sheets are mapped and in the hands of the engravers; fourteen are surveyed and are in the hands of the draftsmen. Of the remaining seventy-eight which are required to cover the entire State, forty-three have been triangulated and are ready to be surveyed for the final topographic mapping.

The operations are detailed in this volume at pp. 13 to 192 and the statement of Hon. Charles D. Walcott, Director of the United States Geological Survey, is given at p. 193.

It is recommended to the Legislature that this co-operation of the State with the United States be continued, and that an appropriation of $30,000 be made therefor.

* * * * * * * * *

Respectfully submitted,
EDWARD A. BOND,
State Engineer and Surveyor of New York.

REPORT

ON THE

Gaugings of Volume of Discharge of Streams

IN THE

STATE OF NEW YORK.

1903.

By ROBERT E. HORTON, Hydrographer.

Under Direction of Hon. EDWARD A. BOND, State Engineer and Surveyor;
in Co-operation with United States Geological Survey,
F. H. NEWELL, Chief Engineer.

REPORT ON PROGRESS OF GAUGINGS ON NEW YORK STREAMS, 1903.

By Robert E. Horton, *Hydrographer.*

OUTLINE OF GAUGING OPERATIONS.

It may be stated at the outset that this report does not contain complete or final results of the work done in accordance with the appropriating clause in chapter 599 of the Laws of 1903, in "determining the water supply available for canals, and for potable and domestic uses, and for the development of water power." The large volume of data accumulated during the field season and the fact that, as explained below, re-computation of the rating tables and discharge curves for all the dams used as gauging stations being necessary, it was found impossible to complete the calculations in time for this report, which contains therefore only the observed gauge heights and discharge measurements at current-meter stations, together with such records for dams as were ready at hand. The report contains therefore relatively little data of daily discharge or run-off. The method used in preceding years, of publishing the complete records from their inception, supplemented by data for the year current has not been followed. Complete data for 1903 will be calculated and will, it is expected, be available in manuscript form, previous to its publication.

The volume of field work accomplished has exceeded that of preceding years. The extension of stream gaugings to include Oswegatchie and Saranac Rivers in the north; Hoosic River and Wappinger Creek in the Hudson River basin; Genesee River, Oak Orchard Creek, Allegheny and Chemung River drainage basins in the western portion of the State, may be noted.

Owing to the co-operation of a number of individuals and corporations, the maintenance of weirs and gauging stations on a number of very small uncontrolled drainage areas has been rendered possible. It is believed that such results are of especial interest as giving an insight into the laws of flow of larger streams, and in relation to municipal water supplies, which are drawn from small catchment areas very commonly throughout the State.

Owing to the continued high water of 1901 and 1902, it had been impossible to obtain new profiles of some of the dams used as gauging stations. The comparative low water of May, June, and September, 1903, has enabled new profiles to be made of all the dams at older gauging stations as well as of those at a number of new stations. In May and June, 1903, experiments were conducted at Cornell University Hydraulic Laboratory under the writer's direction to determine the coefficients of discharge over various forms of broad-crested and Ogee section weirs and dams. A re-computation, on a uniform basis with the above mentioned, of previous experiments of this character, has also been made. The acquisition of this new data has rendered possible a recalculation on a more accurate basis than heretofore of the discharge curves for gauging stations at dams and mills, and the results for these have been withheld from computation until such recalculation can be made.

The following assistants have been employed on the work during 1903:

C. C. Covert, Assistant Engineer, E. P. Roundey, Assistant Engineer, F. H. Tillinghast, Assistant Engineer, Wm. Nunn, Computer and Rodman, Margaret T. Reilly, Clerk and Computer. Services of engineers employed to make special reports, and of numerous individuals and corporations co-operating in the work, are acknowledged in the text.

The methods employed heretofore have been continued, an effort having been made to increase the general accuracy of the work. For general description of the methods of gauging at dams and by current meters, reference is made to pages 15 to 23, of the Report on Gaugings for the year 1902.(a)

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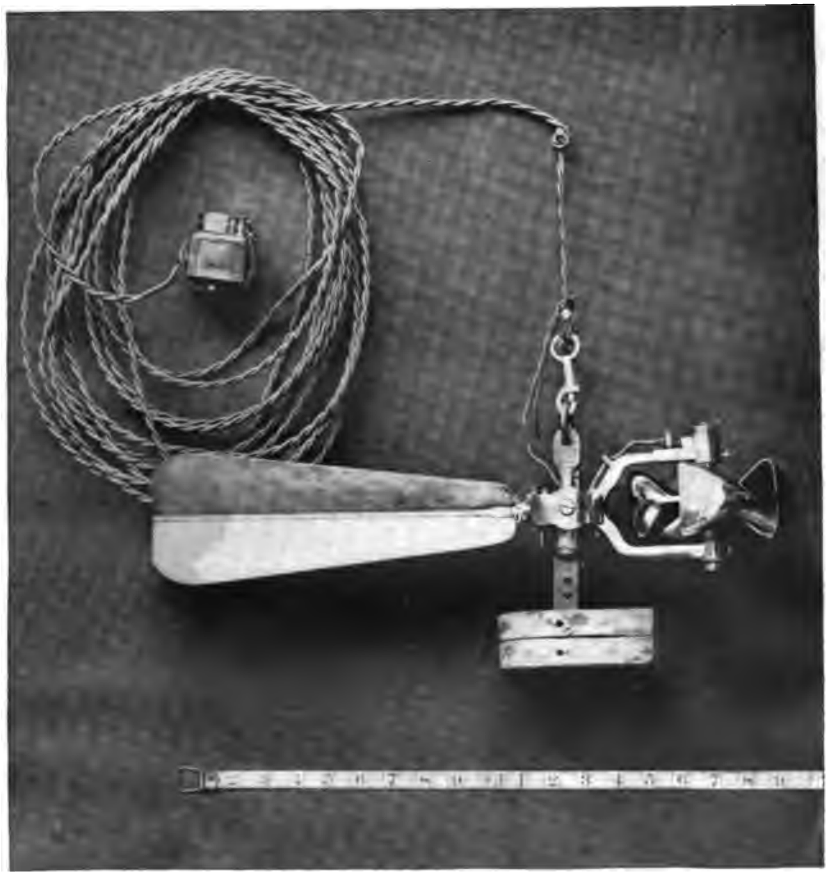
a Report of the State Engineer and Surveyor, 1902 Supplement.



Price Current-meter: Modified large size, 1901.

HYDROGRAPHIC FEATURES OF THE YEAR 1903.

The flow of streams in the winter months, as well as during periods of summer drought, is largely supplied from ground water. The large accumulations of snow in portions of the State, especially the Adirondack region, represent oftentimes a considerable depth of water which is practically stored on the surface, from the time the snow falls until it is melted in the spring or lost through evaporation. In order to clearly understand the regimen of the streams, it is necessary to consider both the ground water and the winter accumulation of surface storage in the form of snow.

The following table shows the estimated depth in inches of water on the drainage area which would result from the accumulated snow lying on the ground at various stations in the Adirondack region, at 8:00 p. m. on Monday of each week during the winters of 1900 to 1903, the ratio of snow depth to equivalent water having been determined by measurement from time to time during the winter. The snow depth is taken from readings at four stations maintained by the U. S. Weather Bureau.

Depth of Accumulated Snow and Equivalent Surface Water Storage, Adirondack Drainage Basins.

WINTER, 1900-1901.			WINTER, 1901-1902.			WINTER, 1902-1903.		
Date.	Average snow depth, inches.	Equivalent water, inches.	Date.	Average snow depth, inches.	Equivalent water, inches.	Date.	Average snow depth, inches.	Equivalent water, inches.
Dec. 3, 1900	15	3	Dec. 2, 1901	4	.8	Dec. 2, 1902	T	F
Dec. 10, 1900	14.66	2.93	Dec. 9, 1901	T		Dec. 8, 1902	T	F
Dec. 24, 1900	18.75	3.75	Dec. 16, 1901			Dec. 15, 1902	4	.8
Dec. 31, 1900	19.25	3.85	Dec. 23, 1901			Dec. 22, 1902	5	1.00
Jan. 7, 1901	23.4	4.68	Dec. 30, 1901	6	1.2	Dec. 29, 1902	9	1.8
Jan. 14, 1901	27.8	5.56	Jan. 6, 1902	6	1.2	Jan. 5, 1903	5.03	1.00
Jan. 21, 1901	22.8	4.56	Jan. 13, 1902	15	3	Jan. 12, 1903	7.75	1.55
Jan. 28, 1901	32.5	6.5	Jan. 20, 1902	18	3.6	Jan. 19, 1903	14.25	2.85
Feb. 4, 1901	32.4	6.48	Feb. 3, 1902	20.5	4.1	Jan. 26, 1903	16	3.2
Feb. 11, 1901	35.5	7.1	Feb. 10, 1902	33	6.6	Feb. 2, 1903		
Feb. 18, 1901	41.5	8.3	Feb. 17, 1902			Feb. 9, 1903		
Mar. 4, 1901	45.4	9.08	Feb. 24, 1902	36	7.2	Feb. 16, 1903		
Mar. 11, 1901	28.75	5.75	Mar. 3, 1902			Feb. 23, 1903	a40.	8.0
Mar. 18, 1901	39.2	7.84	Mar. 10, 1902			Mar. 2, 1903	4.66	.93
			Mar. 17, 1902			Mar. 9, 1903		
			Mar. 24, 1902			Mar. 16, 1903		

a At Twin Rock Bridge, N. Y.

The snow accumulation of the winter 1902-3 was not unusually large. The general melting began early, and was not accompanied by sufficient rains to cause freshets of great magnitude, such for example as had occurred March 1, 1902.

From April 16 to June 7, 1903, was a period of exceptionally light precipitation throughout the State, no rainfall during the month of May and nothing exceeding a trace of rain for a period of fifty-four days being reported at numerous stations of the U. S. Weather Bureau. In the upper Mohawk valley, for example, there had never been previously during the seventy-five years covered by authentic records, a calendar month without some measurable precipitation. The run-off of the streams for the month of May, 1903, is, therefore, of particular interest inasmuch as the water supply was derived wholly from springs, lakes and marsh storage and from ground water. The fact that the ground water supply was well filled early in April resulted in the production of a drought of much less severity than would in all probability have occurred had a season of no rainfall of the same duration happened in the late summer or fall months.

Gauging Stations Maintained in New York During 1903.

STREAM.	Gauging station.	County.	Drainage area square miles.	Reference.	Reciprocal.	Record from	Record to	Observer.
Allegheny River	Red House, N. Y.	Cattaraugus	1,642	....	0.000609013	Sept. 4, 1903	Con.	G. H. Smith.
Byram R., E. Br.	Round Hill, Conn.	Fairfield	4.85	a	.2062	Jan. 1, 1903	Dec. 31, 1903	R. G. Jones.
Byram R., M. Br.	Near Glenville, Conn.	Fairfield	12.00	a	.08333	May 17, 1903	Dec. 31, 1903	Geo. Derby.
Byram R., W. Br.	Schilts Mill, Conn.	Fairfield	11.22	a	.08913	Jan. 15, 1903	Dec. 31, 1903	August Schilt.
Byram River	Pimberwick, Conn.	Fairfield	27.18	a	.03679	Jan. 8, 1903	Con.	Clifford Reynolds.
Beaver River	Beaver, N. Y.	Herkimer	153	c	.006536	June, 1903	Con.	——— ———
Beaver River	Tisse's Br., near Croghan, N. Y.	Lewis	242	b c	.00413223	May 17; 1901	Sept. 26, 1903	Nicholas Tisse.
Black River	Felts Mills, N. Y.	Jefferson	1.851	c b	.0005402	Aug. 29, 1902	Con.	A. H. Tucker.
Cayuta Creek	Waverly, N. Y.	Tioga	149.2	a	.006702	March 1, 1898	March 31, 1902	T. P. Yates.
Chemung River	Chemung, N. Y.	Chemung	2,381	d	.000420	Sept. 7, 1903	Con.	Daniel S. Orcutt.
Chittenango Creek	Chittenango, N. Y.	Madison	78.9	b c	.012674	May 22, 1901	Con.	F. A. Sutter.
Catskill Creek	South Cairo, N. Y.	Greene	263	b	.003802	July 4, 1901	Con.	C. J. Abrams.
Chenango River	Binghamton, N. Y.	Broome	1,582	b	.0006321	July 31, 1901	Con.	E. F. Weeks.
Delaware R., W. Br.	Hancock, N. Y.	Delaware	685	c	.001460	Oct. 15, 1902	Con.	David Pulver.
Delaware R., E. Br.	Hancock, N. Y.	Delaware	919	c	.001088	Oct. 15, 1902	Con.	D. B. Van Etten.
Del. & Hudson Can'l	Creek Locks, N. Y.	Ulster	....	....	....	Oct. 1, 1901	Oct. 29, 1903	J. H. Hasbrouck.
Esopus Creek	Kingston, N. Y.	Ulster	324.5	b	.003082	July 5, 1901	Con.	John Douglas.
Esopus Creek	Olive Bridge, N. Y.	Ulster	242	d	.004132	May 25, 1903	Con.	Jesse B. Boice.
East Canada Creek	Dolgeville, N. Y.	Herkimer	256	b	.003906	Sept. 23, 1898	Con.	Willard Hayward.
Fishkill Creek	Glenham, N. Y., near D. & C. R. R. Br.	Dutchess	198	b	.005051	July 8, 1901	Nov. 7, 1903	E. A. Underhill.
Genesee River	Jones Br., n. Mt. Morris, N. Y.	Livingston	1,412	b e	.0007082	May 22, 1903	Con.	J. T. Trewer.
Genesee River	Mt. Morris, N. Y.	Livingston	1,070	c e	.0009346	....	High water	——— ———
Genesee River	Rochester, N. Y.	Monroe	2,365	c e	.0004228	High water	only from 1893	City Engineer.
Graefenburg Creek	New Hartford, N. Y.	Herkimer	0.282	a	3.546	June 7, 1903	Con.	R. O. Salisbury.
Hoosic River	Buskirk, N. Y.	Rensselaer	....	....	....	Sept. 25, 1903	Con.	Bert C. Henry.
Hudson River	Fort Edward, N. Y.	Saratoga	2,800	b c	.000357	Dec. 1, 1895	Con.	F. E. Chapman.
Hudson River	Mechanicville, N. Y.	Saratoga	4,500	b c	.000222	Jan. 1, 1888	Con.	R. P. Bloss.
Housatonic River	Gaylordsville, Conn.	Litchfield	1,020	d	.0009803	Oct. 23, 1900	Con.	G. H. Monroe.
Honeoye Creek	East Rush, N. Y.	Monroe	238	e	.0042017	Feb. 13, 1903	Con.	Geo. A. Smith.
Indian Lake	Indian Lake, N. Y.	Hamilton	146	c	.0068493	July 22, 1903	Con.	Frank Pelon.
Johnson Brook	Deerfield, N. Y.	Oneida	0.79	a	1.2658	July 15, 1903	Con.	E. H. Fitch.
Mohawk River	Dunsbach Ferry, N. Y.	Saratoga	3,440	b c	.0002907	Oct. 1, 1898	Con.	Robert Wilson.
Mohawk River	Little Falls, N. Y.	Herkimer	1,306	b c	.0007657	Sept. 23, 1898	Con.	John Smeltze. Wm. Hoffman.
Mohawk River	Utica, N. Y.	Oneida	500	b c	.00200	April 3, 1901	May 1, 1903	Wm. Nunn.
Moose River	Moose River, N. Y.	Lewis	374.1	b a	.002673	June 5, 1900	Con.	Chris Hannan.
Mianus River	Near Stamford, Conn.	Fairfield	28.84	a	.03467	Jan. 1, 1903	Dec. 31, 1903	Benj. Sedgwick.

a U. S. Top. map. b Bien's Atlas. c To be checked or recomputed from U. S. G. S. maps. d New York Water Supply Commission.
e Map, Genesee River Watershed.

Gauging Stations Maintained in New York during 1903—(Concluded).

STREAM.	Gauging Station.	County.	Drainage area square miles.	Reference.	Reciprocal.	From	To	Observer.
Mianus River	Bedford, N. Y.	Westchester	10.68	a	.09363	Jan. 6, 1903	Dec. 31, 1903	George Buresch.
Neversink River	Port Jervis, N. Y.	Orange	346	d	.002890	Oct. 16, 1902	Aug. 3, 1903	Edward J. Earley.
Neversink River	Godeffroy, N. Y.	Orange	314.4	....	.003181	Aug. 5, 1903	Oct. 9, 1903	Fannie Olden.
New Hartford Cr.	New Hartford, N. Y.	Oneida	1.18	a	.8475	June 12, 1903	Oct. 10, 1903	John Adrean.
Oriskany Creek	Wood Road, Oriskany, N. Y.	Oneida	143	b c	.006993	June 25, 1901	Dec. —, 1903	C. H. Smith.
Oneida River	Schroeppel's Br., Euclid P. O., N. Y.	Oswego	1,313	b c	.0007616	Aug. 31, 1902	Dec. —, 1903	Arthur McArthur.
Oswego River	Battle Island, N. Y.	Oswego	4,990	b	.0002004	Sept. 14, 1900	Con.	May Parmley.
Oswego River	High Dam, N. Y.	Oswego	5,000	b c	.00020	April 1, 1897	Con.	J. J. Frisbee.
Oak Orchard Creek	Coon's Br., near Medina, N. Y.	Orleans	142.6	a	.007012	May 16, 1903	Con.	Rolla Dunlap.
Oswegatchie River	Eel Weir Br., near Ogdensburg, N. Y.	St. Lawrence	1,577	b	.0006341	April 22, 1903	Con.	Jos. H. LaRue.
Raquette River	Massena Springs, N. Y.	St. Lawrence	1,168.7	b a	.0008554	Sept. 21, 1903	Oct. 17, 1903	Roy Page.
Raquette River	Hannawa Falls, N. Y.	St. Lawrence	962.7	a b	.00105	Sept. 1, 1902	Mar. 31, 1903	Wilson Gilman.
Rondout Creek	Honk Falls, N. Y.	Ulster	88	b c	.011364	Aug. 20, 1903	Con.	Mrs. Geo. H. Jones.
Rondout Creek	Rosendale, N. Y.	Ulster	380	b	.002632	July 6, 1901	Nov. 7, 1903	Annie Huben.
Reel's Creek	Deerfield, N. Y.	Oneida	4.5	a	.2222	Jan. 1, 1901	Con.	E. H. Fitch.
Ramapo River	Near Suffern, N. Y.	Rockland	30.14	a	.033178	Feb. 10, 1903	Con.	———
Saranac River	Saranac Lake, N. Y.	Franklin	157.5	b	.006349	May 17, 1903	Oct. 31, 1903	Benj. R. Baker.
Saranac River	Plattsburg, N. Y.	Clinton	624.0	b	.0016025	March 27, 1903	Con.	A. C. Hare.
Susquehanna River	Binghamton, N. Y.	Broome	2,400	b	.0004166	July 31, 1901	Con.	E. F. Weeks.
Salmon River	Fox Br., near Pulaski, N. Y.	Oswego	264	a b	.003788	Sept. 6, 1900	Dec. —, 1903	S. J. Fox.
Schoharie Creek	Mill Point, N. Y.	Montgomery	934	b	.001071	July 6, 1900	Sept. 26, 1903	Wm. H. Merry.
Schoharie Creek	Prattsville, N. Y.	Greene	240	b	.004167	Nov. 7, 1902	Con.	James Brennan.
Schoharie Creek	Schoharie Falls, N. Y.	Montgomery	930	b	.001075	July 18, 1900	Oct. 17, 1903	Edward Conover.
Starch Factory Cr'k	New Hartford, N. Y.	Herkimer	3.81	a	.2624	May 26, 1903	Con.	Geo. Savage.
Seneca River	Baldwinsville, N. Y.	Onondaga	3,103	b	.0003223	Nov. 12, 1898	Con.	Chas. Brannock.
Skaneateles Outlet	Willow Glen, N. Y.	Onondaga	74.2	a	.013477	March 10, 1895	Con.	Edw. Conron.
Schroon River	Warrensburg, N. Y.	Warren	563	b	.001776	Nov. 1, 1895	Con.	Fred. C. Loss.
Ten Mile River	Dover Plains, N. Y.	Dutchess	195	d	.0051282	Sept. 7, 1901	Nov. 7, 1903	J. J. O'Brien.
Wallkill River	New Paltz, N. Y.	Ulster	736	b	.001359	July 7, 1901	Nov. 10, 1903	E. Tremper to Feb., 1902; C. McEntree to end.
West Canada Creek	Twin Rock Bridge, N. Y.	Oneida	304	a	.002747	Sept. 9, 1900	Dec. —, 1903	Geo. Rood.
Wappinger Creek	Wappinger Falls, N. Y.	Dutchess	215.7	a	.004636	May 19, 1903	Con.	Lee Jackson.
Lake Champlain	Ft. Montgomery, Rouses Pt., N. Y.	Clinton	7,750	......	.00012903	Jan. —, 1875	Con.	Wm. McComb.

a U. S. Top. map. b Bien's Atlas. c To be checked or recomputed from U. S. G. S. maps. d N. Y. Water Supply Commission.

LAKE ONTARIO DRAINAGE.[a]

BEAVER RIVER AT TISSE'S BRIDGE NEAR CROGHAN, LEWIS COUNTY, N. Y.

Beaver River rises in western Hamilton county, crosses Herkimer county and emerges from the Adirondacks at Number Four on the Lewis county line. The flow from the tributary watershed above Beaver, comprising an area of 153 square miles or 47.5 per cent. of the entire drainage area, is regulated by storage in the Beaver flow or "Stillwater," an artificial lake formed by a timber dam 16 feet high.

A new masonry dam has been constructed by the State of New York to replace the timber dam. Below this storage reservoir, the drainage basin is largely a timber covered sandy plain, underlaid by granitic rock, over which the stream falls, making numerous precipitous descents. Water power is developed at various points. A temporary gauging station was established May 10, 1901, at Tisse's Bridge, which crosses the stream between the villages of Belfort and Croghan, at the head of Tisse's Falls, a point where the gaugings will be least obstructed by either logs or ice. The bridge consists of two spans of 70.5 and 51.5 feet width respectively, crossing two arms of the stream on opposite sides of a wooded rocky island.

A 12-foot cypress gauge, divided to feet and tenths, was secured to the down stream face of the right-hand abutment of the right span. The bench mark is a chiseled "O" in the bridge-seat above the gauge board.

Elevation of bench mark........................	100.00
Elevation gauge zero............................	88.70

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[a] Records for the following named gauging stations have not been included in this report:

Black River at Felts Mills, N. Y.
Crystal Creek, New Bremen, N. Y.
Beaver River at Beaver Reservoir, N. Y.
Seneca River at Baldwinsville, N. Y.
Oswego River at High Dam, N. Y.
Genesee River at Rochester, N. Y.
Hemlock Lake at Hemlock Lake, N. Y.
Miscellaneous Gaugings.

Complete descriptions, with data for preceding years for these and other stations in Lake Ontario Drainage, will be found in Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor, N. Y., 1902.

One observation of the river stage has been taken each day by the observer, Nicholas Tisse.

Owing to the existence of cross-currents under the bridge, current meter observations of the velocity have been taken in every square foot of the cross-section of the stream and the direction of flow of the corresponding filaments, as well as their velocity, is taken into consideration in calculating the discharge.

Five current meter measurements have been made, covering the range of variation in the stream stage. They are considered sufficient to furnish an approximate estimate of the daily discharge from the gauge readings.

The State masonry dam at Beaver having been completed, observations of the gate openings, head, and depth on the spillway at that point, were begun in 1903; from these the outflow from the storage reservoir will be calculated. The observations at Tisse's Bridge were discontinued September 26, 1903. In the absence of topographic maps, the drainage area above Tisse's Bridge has been estimated at 242 square miles. The drainage area above the storage reservoir at Beaver is mountainous and timber covered. It contains a large proportion of lake surface, including Red Horse chain.

Current Meter Discharge Measurements of Beaver River, at Tisse's Bridge, near Croghan, N. Y.

DATE.	Hydrographer.	Gauge height feet.	Discharge second-feet.
May 30, 1901	R. E. Horton	2.975	538
June 10, 1901	J. D. Luther	3.525	996
July 4, 1901	J. D. Luther	2.025	283
August 26, 1902	C. C. Covert	2.370	554
March 18, 1903	C. C. Covert	5.315	3,499

Daily Discharge Second-feet, Beaver River (Tisse's Bridge), Croghan, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	......	......	......	......	......	760	314	314	1,050	470	520	520
2	......	......	......	......	......	760	314	275	......	560	560	520
3	......	......	......	......	......	870	275	207	......	700	470	560
4	......	......	......	......	......	980	275	......	......	760	470	520
5	......	......	......	......	......	1,050	314	275	560	610	470	560
6	......	......	......	......	......	980	314	275	353	660	431	610
7	......	......	......	......	......	1,050	314	314	353	610	470	560
8	......	......	......	......	......	980	314	314	275	560	431	470
9	......	......	......	......	......	1,130	275	353	253	610	431	660
10	......	......	......	......	......	1,050	314	392	241	610	353	610
11	......	......	......	......	......	980	275	392	275	560	810	660
12	......	......	......	......	......	760	275	560	241	560	700	920
13	......	......	......	......	......	660	275	353	314	470	431	980
14	......	......	......	......	......	660	241	314	275	610	810	870
15	......	......	......	......	......	560	241	560	520	660	870	......
16	......	......	......	......	......	431	241	392	520	700	760	3,770
17	......	......	......	......	660	353	207	353	610	700	610	1,660
18	......	......	......	......	431	353	241	......	560	700	660	1,350
19	......	......	......	......	431	392	241	......	520	700	560	1,350
20	......	......	......	......	314	560	207	......	470	700	610	1,560
21	......	......	......	......	353	660	......	......	392	660	520	1,280
22	......	......	......	......	470	660	......	......	353	660	520	1,200
23	......	......	......	......	275	392	......	275	392	610	431	1,130
24	......	......	......	......	431	660	392	470	431	392	470	920
25	......	......	......	......	275	520	392	392	353	700	560	870
26	......	......	......	......	560	520	......	353	392	392	610	920
27	......	......	......	......	314	431	353	......	392	610	520	1.050
28	......	......	......	......	660	470	275	......	......	610	610	920
29	......	......	......	......	660	660	660	207	......	610	610	660
30	......	......	......	......	700	392	560	241	275	700	560	660
31	......	......	......	......	610	......	560	275	......	520	......	660
Mean	......	......	......	......	476	689	293	278	365	612	563	1,142
1902.												
1	700	470	1,350	1,870	275	920	700	470	353	314	560	431
2	660	431	1,870	1,770	1,350	810	560	470	275	353	470	392
3	610	431	1,770	1,870	1,870	700	431	920	520	353	392	520
4	610	431	1,280	1,130	1,350	810	431	700	431	353	275	560
5	660	431	1,130	980	1,870	810	470	431	275	275	275	560
6	610	431	980	275	1,560	700	470	431	275	275	241	560
7	560	431	920	......	1,770	920	431	353	275	314	241	520
8	560	431	470	980	2,700	1,050	470	392	275	353	275	520
9	520	392	470	1,560	1,770	920	431	431	314	353	353	660
10	520	431	470	1,450	1,350	1,280	470	700	275	314	431	660
11	470	392	560	1,560	1,050	1,050	470	560	353	314	700	700
12	470	392	870	1,770	660	810	470	431	392	353	810	810
13	470	353	1,770	1,660	1,560	470	431	275	353	275	810	920
14	470	392	2,530	920	431	353	470	275	353	275	660	980
15	470	431	2,370	700	353	431	520	275	275	......	560	980
16	470	431	2,530	700	1,770	810	700	314	207	......	560	920
17	431	431	2,700	810	2,700	1,130	810	810	207	353	431	920
18	431	520	3,770	660	2,040	610	810	920	275	353	520	870
19	810	560	3,210	1,560	2,040	870	700	760	241	392	560	810
20	760	610	2,370	920	520	1,200	700	560	241	353	560	700
21	776	610	1,560	392	1,560	1,050	700	431	207	353	470	700
22	660	660	1,560	520	1,770	980	660	700	207	431	353	660
23	560	660	1,770	920	1,560	1,200	610	810	241	431	431	660
24	520	560	1,770	1,560	1,560	520	610	700	207	353	431	760
25	470	560	1,350	980	3,210	610	660	700	275	810	431	700
26	470	610	1,280	810	3,770	431	610	470	207	810	431	610
27	470	1,280	1,350	980	......	275	470	353	207	700	392	660
28	700	1,350	1,130	700	1,560	431	470	353	275	700	392	560
29	760	......	1,350	2,040	920	470	431	353	275	660	392	560
30	560	......	1,870	1,130	980	392	520	314	314	610	431	470
31	353	......	1,770	......	920	......	431	314	......	560	......	520
Mean	566	540	1,618	1,109	1,620	767	552	515	286	401	461	673

Daily Discharge Second-feet, Beaver River (Tisse's Bridge), Croghan, N. Y. (Concluded).

DAY	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903												
1	560	920	920	2,700	700	275	520	2,530	431	......	......	......
2	560	760	980	2,700	1,560	275	560	2,370	392	......	......	......
3	470	810	1,200	2,700	660	275	700	2,370	275	......	......	......
4	610	920	1,350	2,370	1,560	241	610	2,200	275	......	......	......
5	560	870	1,450	2,370	314	275	520	2,040	275	......	......	......
6	560	920	920	2,700	207	275	241	2,200	431	......	......	......
7	560	810	920	2,700	1,870	241	275	2,200	431	......	......	......
8	520	760	1,200	2,700	353	275	560	2,040	392	......	......	......
9	431	700	1,350	3,210	1,280	314	610	2,200	275	......	......	......
10	431	700	1,660	470	1,870	275	610	2,040	275	......	......	......
11	431	610	2,700	980	1,450	470	660	920	275	......	......	......
12	431	760	2,530	*	1,560	520	520	810	275	......	......	......
13	392	810	2,700	*	1,350	610	431	810	314	......	......	......
14	431	810	2,960	*	275	610	431	760	353	......	......	......
15	431	870	2,700	*	275	610	......	810	353	......	......	......
16	431	810	2,700	*	392	520	......	920	353	......	......	......
17	431	700	2,700	*	241	353	......	920	314	......	......	......
18	314	700	3,770	*	920	353	......	870	314	......	......	......
19	431	660	......	660	392	275	207	870	314	......	......	......
20	392	610	......	920	......	275	275	520	314	......	......	......
21	470	610	......	660	392	392	610	431	314	......	......	......
22	560	560	......	700	......	470	520	431	314	......	......	......
23	520	520	......	700	......	520	431	353	275	......	......	......
24	470	470	......	660	......	610	431	353	275	......	......	......
25	660	470	......	700	......	610	520	392	275	......	......	......
26	700	560	......	275	......	560	610	392	314	......	......	......
27	560	610	......	700	......	520	700	431	......	......	......	......
28	610	700	3,770	810	......	520	1,130	431	......	......	......	......
29	660	......	3,770	470	......	610	1,350	470	......	......	......	......
30	760	......	1,870	1,560	......	610	2,200	431	......	......	......	......
31	920	......	2,530	......	......	......	2,700	431	......	......	......	......
Mean	525	715	3,003	1,496	608	425	626	1,127	323	......	......	......

* No record.

Estimated Monthly Discharge of Beaver River (Tisse's Bridge), Croghan, N. Y.
[Drainage area, 274.4 square miles.]

MONTH.	Discharge in Second-feet.			Run-off.		Rainfall—inches.*a*
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1901.						
January	....	....	....	....	....	4.73
February	....	....	....	....	....	3.89
March	....	....	....	....	....	3.81
April	....	....	....	....	....	0.95
May 17-31	700	275	476	1.73	1.99	3.40
June	1,130	353	689	2.51	2.80	5.38
July *b*	660	50	293	1.07	1.23	4.67
August *b*	560	50	278	1.01	1.16	5.82
September *b*	1,050	80	365	1.33	1.48	5.85
October	760	392	612	2.23	2.57	3.99
November	870	353	563	2.05	2.29	7.52
December *b*	6,430	470	1,142	4.16	4.80	5.17
The year	....	....	....	....	....	55.18
1902.						
January	810	353	566	2.06	2.37	3.33
February	1,350	353	540	1.97	2.05	5.81
March	3,770	470	1,618	5.89	6.79	6.35
April *b*	2,040	95	1,109	4.04	4.51	5.27
May *b*	3,900	275	1,620	5.90	6.80	4.08
June	1,280	275	767	2.79	3.11	5.04
July	810	431	552	2.01	2.32	7.36
August	920	275	515	1.87	2.16	5.48
September	520	207	286	1.04	1.16	2.72
October *b*	810	50	401	1.46	1.68	5.26
November	810	241	461	1.68	1.87	4.36
December	980	431	673	2.45	2.82	5.40
The year	....	....	....	....	37.64	60.41

a At Number Four. *b* Estimated discharge on days above or below limit of rating curve included in monthly means.

Estimated Monthly Discharge of Beaver River (Tisse's Bridge), near Croghan, N. Y.
[Drainage area 274.4 square miles.]

MONTH.	Discharge in Second-feet.			Run-off.		Rainfall—inches.*a*
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1903.						
January	920	314	525	1.91	2.20	6.16
February	920	470	715	2.60	2.70	*b* 5.67
March *c*	6,800	920	3,003	10.93	12.60	*b* 4.06
April 1-11; 13-30	3,210	275	1,496	5.45	6.08	2.46
May *c*	1,870	75	608	2.21	2.55	0.45
June	610	241	425	1.55	1.73	7.21
July *c*	2,700	95	626	2.28	2.63	10.08
August	2,530	353	1,127	4.10	4.73	4.18
September 1-26	431	275	323	1.18	1.32	1.77
October	....	....	....	....	....	7.65
November	....	....	....	....	....	3.06
December	....	....	....	....	....	9.56
The year	....	....	....	....	....	62.26

a At Number Four. *b* Mean of Lowville and North Lake. *c* Estimated discharge on days above or below limit of rating table included in monthly mean.

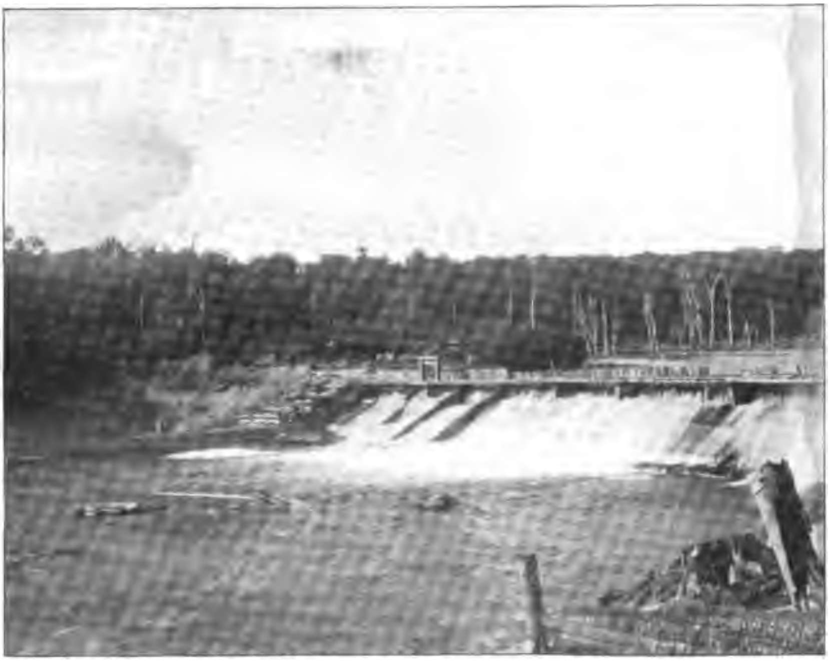
MOOSE RIVER AT MOOSE RIVER, LEWIS COUNTY, N. Y.

Moose River drainage basin lies mainly in Herkimer and Hamilton counties, N. Y. The stream is tributary to Black River at Lyons Falls. Gauging station established June 5, 1902, Chris Hannan, observer; two readings of the stream stage being taken daily on a graduated board scale attached to posts on the left bank of the stream at Moose River village, the gauge comprising a high-water and a low-water section.

The drainage basin east of the 75th meridian is shown on the Big Moose, Raquette Lake, Old Forge and Canada Lakes quadrangles of the U. S. Geological Survey Topographic maps. This area contains a large number of lakes, including the Fulton Chain and Moose lakes. These lakes are at a general elevation 1,700 to 1,800 feet above tide, and their aggregate water surface is several per cent. of the total drainage area. The lakes receive the drainage from precipitous serrated slopes from which they are fed through numerous small tributaries. The drainage basin is underlaid by granitic gneiss, the soil being in general sandy and timber covered. The head waters are in the region of maximum precipitation of the State as well as in the region of greatest accumulated snow fall.

A cableway was erected at the gauging station in June, 1903, having a clear span of 269 feet, from which the following current meter measurements have been made. The bed of the stream is of cobble, the current smooth, depth fairly uniform. A short distance below occurs a fall. The stream is smooth above the gauging station to the foot of McKeever dam, two miles upstream, but is divided by an island, a short distance above the gauge, which creates an ice jamb during spring freshets. The gauge was carried out by such an ice freshet February 28, 1903, and was replaced at a slightly different elevation. The bench mark is on top of a boulder on the left stream bank 300 feet upstream from cableway.

Elevation bench mark, assumed....................	100.00
Elevation gauge zero prior to February 28, 1903......	84.64
Elevation gauge zero after February 28, 1903........	84.47



Moose River: Timber Dam at McKeever, Herkimer County, N. Y.

The flow for the spring months is controlled by lumbermen's dams, large volumes of water being turned into the stream when required for log driving.

Drainage Areas of Moose River. *a*

	Square miles.
South branch Moose River, above Indian River	67.2
Indian River, above mouth	50.2
Total	117.4
Middle branch Moose River, above Old Forge	52.3
Moose River, above Moose River gauging station	374.1
Moose River, above mouth	439.6

a From U. S. Geol. Maps, East of 75th Meridian, remainder from Bien's Atlas of New York.

Current Meter Discharge Measurements of Moose River at Moose River, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1903.			
June 11	C. C. Covert	1.1	287
June 13	L. A. Mitchell	4.2	1,821
June 13	L. A. Mitchell	3.9	1,580
June 14	L. A. Mitchell	2.87	940
June 14	L. A. Mitchell	2.69	884
July 4	H. H. Halsey	1.80	438
July 4	H. H. Halsey	1.80	485

Mean Daily Gauge Height of Moose River at Moose River, N. Y. *b*

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	1.9	3.35	4.45	4.90	1.90	1.00	1.80	2.50	1.95	1.50	1.75	1.25
2	1.75	3.45	5.00	4.55	1.80	1.00	2.00	1.85	1.70	1.65	1.60	1.20
3	1.75	3.30	4.45	4.60	1.65	.90	2.30	1.60	1.35	1.65	1.50	1.15
4	2.05	3.20	4.10	6.70	1.60	.90	1.90	1.50	.95	1.55	1.65	1.10
5	2.15	3.20	3.70	5.60	1.50	1.10	1.45	2.30	1.00	1.85	1.55	1.05
6	2.05	2.70	3.35	4.60	1.45	1.10	2.10	3.10	.90	2.50	1.55	1.05
7	1.90	2.80	3.10	4.15	1.40	1.10	2.80	2.40	.55	2.10	1.50	1.10
8	1.80	2.70	2.95	4.40	1.35	1.15	2.40	2.10	.70	1.70	1.55	1.10
9	1.70	2.60	3.35	4.40	1.45	1.05	1.95	2.20	.70	4.05	1.35	1.05
10	1.65	2.60	4.25	4.60	1.30	1.00	1.70	2.55	.90	7.50	1.30	1.00
11	1.60	2.50	4.85	4.60	1.20	1.20	1.55	2.50	1.40	5.15	1.30	1.05
12	1.70	2.95	5.50	4.25	1.15	2.40	1.35	3.80	1.55	3.95	1.25	1.10
13	1.80	3.55	a	4.15	1.10	3.90	1.05	4.25	1.55	3.50	1.20	1.15
14	1.80	3.55	......	4.15	1.20	2.20	1.05	2.80	1.45	3.35	1.25	1.15
15	1.80	3.35	......	4.10	1.20	1.85	.95	2.45	1.40	3.20	1.05	1.15
16	1.80	3.15	4.80	3.95	1.10	1.45	.90	2.05	1.40	3.10	.95	1.40
17	1.80	2.95	4.85	3.75	1.10	1.25	.85	1.85	1.55	3.40	1.20	1.50
18	1.70	2.80	5.35	3.55	1.10	1.15	.80	1.60	1.70	5.90	2.25	1.30
19	1.70	2.70	6.15	3.20	1.10	1.10	1.10	1.30	1.80	5.35	2.25	1.50
20	1.70	2.60	7.20	2.95	1.10	1.05	1.45	1.20	1.65	4.20	1.85	1.65
21	1.80	2.50	a	2.75	1.20	1.45	1.65	1.15	1.55	3.75	1.65	1.90
22	1.80	2.50	......	2.45	1.20	3.00	1.65	1.05	1.50	3.40	1.75	2.50
23	1.80	2.50	......	2.55	1.20	2.85	3.00	1.05	1.60	3.25	1.55	2.55
24	1.80	2.40	......	2.95	1.20	2.15	3.25	.95	1.45	3.05	1.50	2.60
25	1.80	2.30	......	2.65	1.20	2.60	2.40	1.15	1.45	3.30	1.45	2.45
26	1.80	2.30	......	2.35	1.20	2.75	1.60	2.15	1.40	2.85	1.45	2.25
27	1.80	2.30	......	2.25	1.05	2.80	1.95	1.95	1.40	2.50	1.40	2.20
28	1.80	2.70	......	2.10	1.00	2.05	1.70	1.50	1.55	2.30	1.35	2.10
29	1.80	......	5.95	1.95	1.10	1.75	1.45	1.25	1.60	2.10	1.40	2.20
30	2.20	......	5.70	1.90	1.10	1.50	2.20	1.30	1.65	1.95	1.35	2.00
31	2.95	......	5.35	......	1.00	......	2.85	1.40	......	1.90	......	1.85

a Ice freshet. Stream obstructed. *b* Stream frozen in winter.

SALMON RIVER AT FOX BRIDGE ABOVE PULASKI, OSWEGO COUNTY, N. Y.

A current meter gauging station was established at this bridge September 5, 1900. The original gauge was a vertical board scale attached to the upstream end of the center pier, having its zero mark at elevation 88.41 feet; the top of the capstone of the central pier, upstream end, being used as a bench mark, with arbitrary elevation 100.00.

This gauge was carried away by ice in the winter of 1901-2, and was replaced July 23, 1902, by a standard chain and weight gauge, having its datum at elevation 87.21 feet.

In the following table are given the results of all current meter measurements that have been made, with the stage referred to the bench mark above described. The gauge readings have been taken twice each day by S. J. Fox, and have been continued throughout winter and summer; the winter readings being obtained by observing the height to which the water rose in a hole in the ice underneath the gauge. Owing to the obstruction of the river channel by ice, the discharge for the winter period has not been deduced. Two approximate measurements, with the stream ice-filled, are shown in the accompanying table. Discharge measurements made during 1903, indicate that the excessive anchor ice formation of the preceding winter, followed by severe spring freshets, modified the stream channel near the gauging bridge. The rating table, deduced from measurements during 1903, indicates a lower discharge for the smaller gauge heights than the previous rating table.

The gauging bridge consists of two spans 183.5 feet between abutments. The stream bed is of gravel and cobble, relatively flat and shallow. There are also two small overflow channels, and a flood-plain at an average elevation, at the highway, of 95 feet; the discharge through these is included in the high water measurements.

The drainage basin above the gauging station is rolling and very sandy, rock lying near the surface in the upper regions of

Salmon River Falls: (110 feet) Oswego County, N. Y., 1902, undeveloped. During high water.

the watershed, in which locality there are also extensive areas of original forest.

The drainage area at the gauging station is provisionally taken at 264 square miles.[a]

The drainage basin is located in a region of heavy snowfall; several feet of snow sometimes accumulating in the forest areas, and, by gradually melting, feeding the stream during March and April. The current meter measurements are made at five foot intervals across the stream from the downstream side of Fox Bridge, which is located about two miles upstream from Pulaski. The location of the gauging station is shown on the Pulaski Topographic sheet, U. S. Geological Survey map.

Current Meter Discharge Measurements of Salmon River, at Fox Bridge, near Pulaski, N. Y.

DATE.	Hydrographer.	Elevation, water surface.	Discharge second-feet.
1900.			
September 4		89.44	102
1901.			
April 12	R. E. Horton	91.81	2,536
April 24	R. E. Horton	92.71	3,476
May 13	R. E. Horton	90.54	824
May 21	J. D. Luther	90.0	422
June 1	J. D. Luther	90.91	1,070
June 8	J. D. Luther	92.51	3,437
1902.			
July 2	R. E. Horton	91.15	1,392
July 5	H. R. Beebe	92.16	2,889
July 6	H. R. Beebe	92.24	2,916
July 6	H. R. Beebe	92.27	2,881
July 23	H. R. Beebe	90.70	842
1903.			
February 27	C. C. Covert	90.8	b 488
February 27	C. C. Covert	90.8	b 492
March 19	C. C. Covert	93.46	5,866
March 19	C. C. Covert	93.41	5,869
May 5	C. C. Covert	90.31	416
May 12	C. C. Covert	90.0	260
May 15	H. H. Halsey	89.96	305
June 24	H. H. Halsey	90.45	516
June 24	H. H. Halsey	90.45	520
September 26	H. H. Halsey	89.66	124

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[a] From Blen's Atlas of the State of New York.

[b] Measurements made in left-hand section, containing considerable anchor ice. Right-hand section frozen solid.

Mean Daily Discharge, Second-feet, of Salmon River, at Fox Bridge, near Pulaski, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903												
1	......	......	......	1,940	349	125	620	620	408	241	364	364
2	......	......	......	1,830	364	118	1,230	422	300	451	364	364
3	......	......	......	2,470	144	118	620	300	253	451	312	364
4	......	......	......	6,430	408	110	408	276	218	335	312	312
5	......	......	......	3,820	436	110	323	620	181	655	335	312
6	......	......	......	1,680	378	110	300	620	181	781	697	312
7	......	......	......	1,720	323	110	349	637	162	515	550	364
8	......	......	......	4,270	335	110	265	532	162	697	436	364
9	......	......	......	2,930	335	110	199	465	153	3,190	422	364
10	......	......	......	2,300	288	125	181	697	144	5,520	364	335
11	......	......	......	2,060	265	110	181	515	323	3,760	335	335
12	......	......	......	1,650	253	253	144	436	349	1,680	364	312
13	......	......	......	1,480	241	1,010	153	408	253	1,010	408	*a*
14	......	......	......	1,350	241	550	153	323	190	739	393	......
15	......	......	......	1,480	229	393	171	253	162	620	364	......
16	......	......	......	1,480	218	300	181	218	144	480	364	......
17	......	......	......	1,230	208	253	171	190	144	480	585	......
18	......	......	......	965	190	276	144	181	265	3,460	1,140	......
19	......	......	......	844	181	265	144	171	288	2,380	760	......
20	......	......	......	718	171	241	190	162	241	1,420	532	......
21	......	......	......	676	162	229	253	181	208	1,070	515	......
22	......	......	......	602	153	364	265	153	181	697	550	......
23	......	......	......	550	153	349	515	144	144	602	515	......
24	......	......	......	515	162	465	532	125	144	532	585	......
25	......	......	......	465	144	1,140	335	229	144	480	451	......
26	......	......	......	451	144	2,060	288	802	125	451	436	......
27	......	......	......	422	144	844	253	451	118	422	451	......
28	......	......	......	408	153	515	208	312	190	422	422	......
29	......	......	......	378	144	378	229	241	349	408	312	......
30	......	......	......	378	144	300	890	378	288	393	364	......
31	......	......	......	......	134	......	1,480	422	......	393	......	......
Mean	......	......	......	1,584	232	382	367	370	214	1,120	419	......

a From this date river obstructed by ice.

Estimated Monthly Discharge of Salmon River, at Fox Bridge, near Pulaski, N. Y.

[Drainage area 264 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
April	6,435	378	1,584	6.003	6.70
May	436	134	232	.879	1.01
June	2,058	110	382	1.448	1.62
July	1,482	144	367	1.391	1.60
August	802	125	370	1.402	1.61
September	408	118	214	.811	.90
October	5,518	241	1,120	4.245	4.89

CHITTENANGO CREEK AT CHITTENANGO, MADISON COUNTY, N. Y.

A current meter gauging station was established at Main street highway bridge in Chittenango village May 22, 1901. The stream at this point is entrained between parallel walls, affording a channel 50 feet wide, over which the bridge passes in a single span. The bridge stands at an angle to the thread of the stream, and has a span between abutments of 57 feet. The gauge board is secured in a vertical position to the right abutment on the upstream side, and reads decimally from zero to 8 feet. The stage of the stream is observed twice daily by the gauge reader, Frank A. Sutter. The bench mark is on the upstream corner of the coping of the right-hand bridge abutment.

Elevation bench mark	100.00
Elevation gauge zero	91.77

The gauging station is one-half mile above the State dam diverting water for the supply of the summit level of Erie Canal. The flow of Chittenango Creek above Chittenango is regulated by storage in Cazenovia Lake and Erieville Reservoir.[a]

ERIEVILLE RESERVOIR.

Tributary watershed	5.4 square miles
Storage capacity	318,424,000 cubic feet
Water surface	340 acres

CAZENOVIA LAKE.

Tributary watershed	8.7 square miles
Storage capacity	206,997,000 cubic feet
Water surface	1.7 square miles

The drainage basin is deeply rolling, mostly cleared and has a heavy, impervious soil with extensive sodded-meadow areas. The soil is underlaid by shale rock, often outcropping, and affording numerous springs. The stream tributaries are somewhat sparse.

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[a] Data below from New York Barge Canal Report, 1900.

Marsh and swamp areas are very limited, with the exception of the Nelson Swamp about two square miles in area.

Cazenovia Lake is located at elevation 1,190. From its outlet to the foot of the plateau at Erie Canal crossing, the stream descends 770 feet, the distance, following the general trend of the valley, is 11 miles. The freshet of December 15, 1901, changed the cross-section of the stream at the gauging station. Separate rating curves have been prepared for the periods preceding and following that date.[a]

Drainage Areas of Chittenango Creek.[b]

LOCATION.	Area square miles.
Above Chittenango Falls	63.0
Above gauging station	78.9
Above mouth	326.3

Current Meter Discharge Measurements of Chittenango Creek, at Chittenango, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1903.			
March 3	C. C. Covert	2.50	276
March 3	C. C. Covert	2.48	272
March 3	C. C. Covert	2.50	272
March 14	C. C. Covert	2.71	368
March 24	Wm. Nunn	3.025	518
May 1	Wm. Nunn	1.80	97
May 1	Wm. Nunn	1.79	95
May 20	Wm. Nunn	1.40	48
May 20	Wm. Nunn	1.40	49
June 29	H. H. Halsey	1.60	62
June 29	H. H. Halsey	1.60	62
October 10	Wm. Nunn	3.85	1,000
October 13	Wm. Nunn	2.14	183
October 14	Wm. Nunn	2.10	177

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[a] From U. S. Geol. Survey Topographic Map, Morrisville, Oneida, Cazenovia, Chittenango, Tully and Syracuse quadrangles.

[b] For results of Gaugings of Chittenango Creek at Bridgeport just above the inflow to Oneida Lake, see Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor of New York, pp. 52 to 57.

Mean Daily Discharge, Second-feet, Chittenango Creek, Chittenango, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	......	......	......	......	......	288	73	48	82	52	56	77
2	......	......	......	......	......	379	73	48	82	52	56	155
3	......	......	......	......	......	235	64	56	64	52	56	208
4	......	......	......	......	......	191	64	56	52	52	61	56
5	......	......	......	......	......	172	90	56	56	52	64	64
6	......	......	......	......	......	148	116	61	56	52	61	64
7	......	......	......	......	......	404	103	73	45	48	64	64
8	......	......	......	......	......	299	73	69	42	52	64	64
9	......	......	......	......	......	226	73	61	42	52	64	82
10	......	......	......	......	......	155	73	64	56	52	69	682
11	......	......	......	......	......	129	73	48	56	52	56	208
12	......	......	......	......	......	136	73	73	52	52	103	164
13	......	......	......	......	......	116	56	73	64	52	90	148
14	......	......	......	......	......	103	56	73	52	52	56	*
15	......	......	......	......	......	90	48	73	48	52	56	*
16	......	......	......	......	......	90	56	64	48	52	90	968
17	......	......	......	......	......	90	64	69	56	52	56	728
18	......	......	......	......	......	82	56	56	52	56	56	669
19	......	......	......	......	......	82	56	64	61	61	56	504
20	......	......	......	......	......	343	56	73	52	56	56	259
21	......	......	......	......	......	467	56	73	61	52	56	242
22	......	......	......	......	90	244	56	73	52	52	56	142
23	......	......	......	......	217	404	56	73	52	61	56	130
24	......	......	......	......	129	208	56	77	52	64	61	130
25	......	......	......	......	116	142	61	56	52	64	110	130
26	......	......	......	......	97	142	56	64	52	64	82	130
27	......	......	......	......	116	116	48	64	48	64	69	130
28	......	......	......	......	155	90	42	64	48	61	90	130
29	......	......	......	......	225	90	42	64	48	61	73	136
30	......	......	......	......	310	73	69	69	52	56	73	130
31	......	......	......	......	288	......	61	73	......	56	......	130
Mean	......	......	......	......	175	191	64	65	54	55	67	232
1902.												
1	130	93	1,922	210	78	102	193	226	50	111	111	84
2	130	93	1,638	210	78	93	130	259	72	168	111	84
3	130	1,132	1,170	180	78	130	276	180	66	111	111	130
4	130	404	786	180	78	876	210	155	66	111	130	93
5	130	454	504	210	78	359	242	130	66	111	180	93
6	120	318	210	210	78	242	370	504	66	155	180	93
7	102	318	259	210	78	180	404	242	60	180	180	93
8	93	210	318	180	78	276	276	259	54	193	168	93
9	78	130	318	454	78	276	210	193	72	180	155	84
10	78	102	318	531	78	318	348	180	142	155	102	84
11	78	78	380	318	72	380	226	180	78	155	102	84
12	78	78	1,132	318	66	454	155	155	66	142	120	93
13	78	78	1,324	318	66	276	130	130	54	120	111	93
14	78	78	669	276	66	226	180	120	54	102	111	93
15	78	78	558	276	66	430	193	111	78	84	130	93
16	78	78	558	218	66	380	180	102	78	102	130	226
17	78	78	1,324	180	66	259	142	111	78	130	120	210
18	78	78	669	180	66	180	130	111	78	155	111	180
19	78	78	404	180	78	162	130	111	78	218	111	186
20	78	78	318	180	93	155	338	102	78	111	93	180
21	78	78	318	155	84	180	338	93	78	84	93	180
22	102	93	404	130	78	155	640	93	78	84	93	586
23	93	78	404	111	78	130	276	84	72	102	93	359
24	78	78	276	111	78	111	226	78	66	111	93	276
25	78	78	276	111	93	111	168	78	66	111	72	210
26	78	78	276	111	168	180	155	78	111	111	72	210
27	130	78	242	93	93	142	640	66	111	111	78	180
28	111	786	242	93	102	111	404	66	111	558	84	180
29	93	......	242	78	155	120	259	54	102	259	84	180
30	93	......	242	78	155	155	180	54	93	155	84	180
31	93	......	242	......	130	......	180	54	......	120	......	180
Mean	94	192	579	203	87	238	256	141	77	148	114	164

* Record not available.

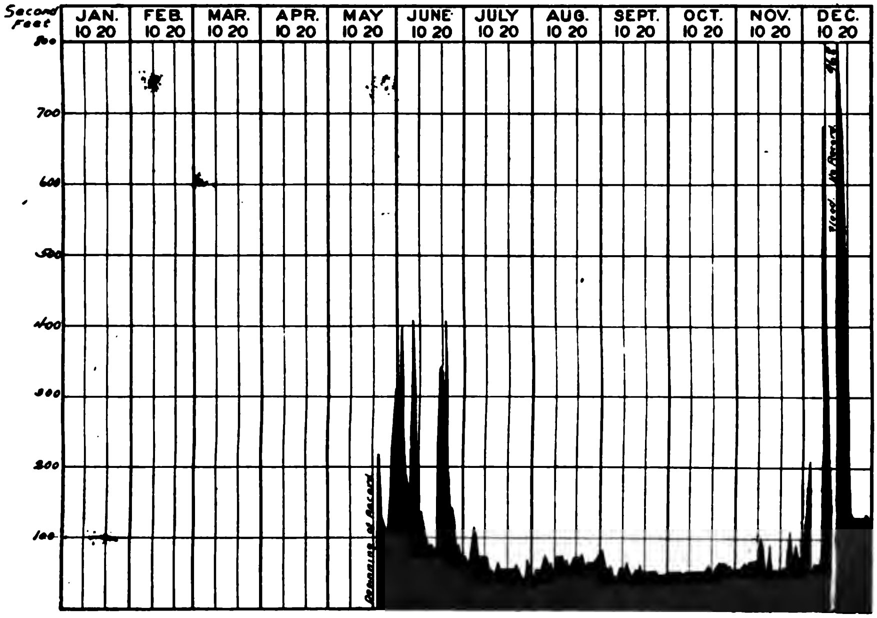
Mean Daily Discharge, Second-Feet, Chittenango Creek, Chittenango, N. Y.—(Concluded).

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	174	180	558	296	111	45	60	45	93	54	130	102
2	174	180	359	276	93	45	54	45	66	54	111	93
3	242	318	276	276	78	45	54	45	60	45	111	78
4	234	669	242	404	60	45	54	45	50	45	111	78
5	234	479	296	242	54	45	54	45	45	45	130	78
6	201	318	318	242	54	45	78	45	45	45	130	78
7	193	276	276	296	54	45	54	66	45	45	111	72
8	180	242	479	359	54	45	54	60	45	84	111	66
9	142	242	816	318	54	45	54	45	45	359	111	66
10	130	218	558	318	54	45	54	45	45	1,132	111	66
11	130	242	876	276	54	45	54	45	45	906	93	60
12	130	338	531	276	54	155	54	45	45	242	93	54
13	130	318	479	276	54	78	54	45	45	168	93	54
14	130	242	380	242	54	50	54	45	45	155	93	54
15	130	210	296	242	54	60	54	45	45	155	93	54
16	130	210	296	226	54	66	54	45	45	155	93	66
17	130	180	296	210	54	66	54	45	45	168	226	54
18	111	180	276	210	54	66	54	45	45	558	180	54
19	111	155	242	180	54	66	54	45	45	454	120	93
20	111	155	226	180	54	78	54	111	45	359	111	93
21	155	168	210	168	54	155	54	54	45	210	111	130
22	130	180	338	155	54	111	60	45	45	210	111	111
23	130	155	786	142	54	84	93	45	45	180	111	93
24	162	155	544	130	54	78	66	45	45	180	155	93
25	120	155	430	130	50	130	54	93	45	155	111	93
26	120	155	318	130	45	120	54	130	45	142	111	78
27	111	142	318	130	45	93	45	78	45	130	111	66
28	120	984	318	120	45	66	45	45	45	168	111	93
29	242	......	296	111	45	60	45	142	45	180	111	93
30	669	......	276	111	45	66	45	102	45	162	93	93
31	210	......	504	......	45	......	45	93	45	130	......	93
Mean	171	266	400	222	56	71	55	60	48	228	117	79

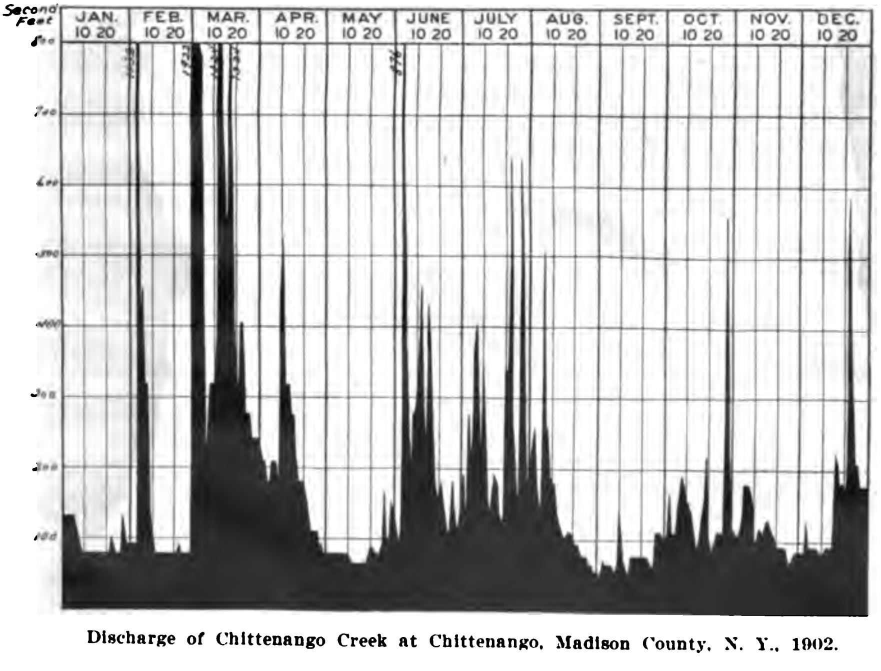
Estimated Monthly Discharge of Chittenango Creek, Chittenango, N. Y.
[Drainage area, 79 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		Rainfall — inches.*b*
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1901.						
May 22 to 31	310	90	175	2.222	2.56	5.79
June	467	73	191	2.426	2.72	5.62
July	116	42	64	.813	.94	3.33
August	77	48	65	.826	.95	3.87
September	82	42	54	.686	.77	2.86
October	64	48	55	.698	.80	2.32
November	110	56	67	.851	.95	3.47
December	*a*	56	232	2.946	3.39	4.93
The year	....	....	....	....	13.08	32.19
1902.						
January	130	78	94	1.194	1.37	1.48
February	1,132	78	192	2.438	2.54	3.94
March	1,922	210	579	7.353	8.46	3.36
April	531	78	203	2.578	2.88	1.96
May	168	66	87	1.105	1.27	3.75
June	876	93	238	3.022	3.38	6.18
July	640	130	256	3.251	3.74	7.12
August	504	54	141	1.791	2.06	3.65
September	142	50	77	.978	1.09	2.50
October	558	84	148	1.880	2.16	4.83
November	180	72	114	1.448	1.62	1.62
December	586	84	164	2.083	2.40	4.25
The year	....	....	....	....	32.97	44.64

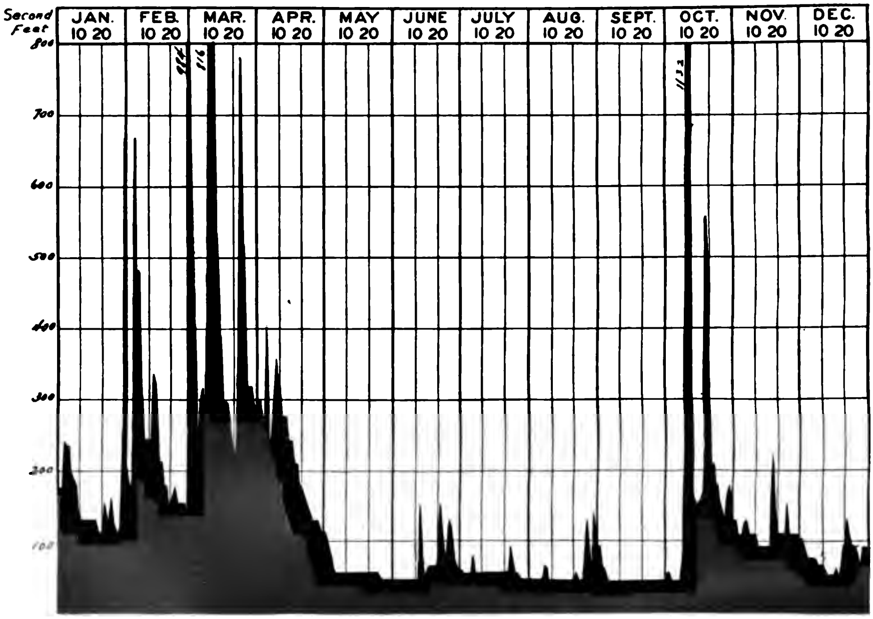
a Not available. Flood December 14-15, 1901.
b Mean of Bouckville and Fayetteville records.



Discharge of Chittenango Creek at Chittenango, Madison County, N. Y., 1901.



Discharge of Chittenango Creek at Chittenango, Madison County, N. Y., 1902.



Discharge of Chittenango Creek at Chittenango, Madison County, N. Y., 1903.

Estimated Monthly Discharge of Chittenango Creek, Chittenango, N. Y.

[Drainage area 79 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		Rainfall, inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1903						
January	669	111	171	2.172	2.50	2.96
February	984	142	266	3.378	3.52	2.59
March	876	210	400	5.08	5.84	4.69
April	404	111	222	2.819	3.15	2.08
May	111	45	56	.711	.82	0.11
June	155	45	71	.902	1.00	8.76
July	93	45	55	.698	.80	1.24
August	142	45	60	.762	.88	5.19
September	93	45	48	.610	.68	1.84
October	1,132	45	228	2.900	3.33	7.78
November	226	93	117	1.486	1.66	2.24
December	130	54	79	1.003	1.15	....
The year	....	....	....	....	25.33	....

SKANEATELES OUTLET AT WILLOW GLEN, ONONDAGA COUNTY, N. Y.[a]

The daily discharge over a thin edged weir, located in the village of Willow Glen, one and one-half miles below the foot of Skaneateles Lake, has been observed, beginning March 10, 1895. The weir has a crest length of 27 feet, with two end contractions. The discharge is calculated from the observed depth on a stake set with its top at crest level 5.2 feet upstream from the weir, by means of the Francis formula, including corrections for end contractions and velocity of approach.

Beginning July 1, 1894, the water supply of the City of Syracuse has been drawn from Skaneateles Lake and the amount of its diversion should be added to the discharge over Willow Glen Weir to obtain the total run-off from the drainage basin. The calculated diversion, as determined from the record of gate openings and head at the inlet gates, using the formula for orifices with a constant coefficient stated as 0.62, have been furnished by the city of Syracuse. The observations were taken at the weir and gates by Edward Conron.

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[a] For complete description of gaugings which have been made of this stream, see Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor of New York for 1902, pp. 61 to 76.

Drainage Areas, Skaneateles Lake. [a]

	Square miles.
Land surface above State dam at Skaneateles	60.25
Water surface of lake at Skaneateles	12.75
Total drainage area above foot of lake	73.00
Percentage water surface above foot of lake	17.46
Total area above Willow Glen Weir	74.25
Area above Erie Canal at Jordan	93.00

The lake surface is at elevation 865 feet above tide. The outlet descends 465 feet from Skaneateles Village to the Erie Canal crossing near Jordan, a distance of 12 miles.

Skaneateles Outlet enters Seneca River above Cross Lake. The average width of the land surface on the two sides of the lake is two and one-half miles. In this distance occurs a rise of 400 to 800 feet, the greater portion being within one mile of the lake on either side. The surface inflow takes place through numerous short lateral feeders flowing down these slopes.

Actual Daily Discharge, Second-feet, of Skaneateles Outlet at Willow Glen Weir, Willow Glen, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903												
1	80.0	82.8	80.0	91.2	122.1	116.2	97.2	103.4	109.8	109.8	122.7	91.2
2	80.0	80.0	85.5	94.2	116.2	116.2	97.2	103.4	109.8	113.0	122.7	91.2
3	80.0	82.8	82.8	103.4	116.2	116.2	97.2	103.4	109.8	109.8	122.7	91.2
4	80.0	82.8	82.8	116.2	116.2	116.2	97.2	106.6	129.2	109.8	122.7	91.2
5	80.0	85.5	82.8	116.2	116.2	116.2	97.2	106.6	129.2	109.8	122.7	91.2
6	80.0	85.5	82.8	116.2	116.2	116.2	103.4	109.8	129.2	109.8	122.7	91.2
7	80.0	82.8	82.8	122.7	116.2	109.8	97.2	122.7	129.2	109.8	122.7	91.2
8	80.0	82.8	88.3	171.2	116.2	109.8	97.2	109.8	129.2	122.7	116.2	91.2
9	80.0	82.8	97.2	171.2	116.2	109.8	97.2	109.8	113.0	132.5	109.8	91.2
10	80.0	82.8	88.3	178.9	116.2	103.4	119.4	109.8	109.8	149.5	109.8	91.2
11	80.0	82.8	100.3	175.0	116.2	103.4	119.4	106.6	116.2	122.7	109.8	91.2
12	80.0	85.5	94.2	156.6	116.2	109.8	122.7	103.4	113.0	113.0	109.8	91.2
13	80.0	82.8	91.2	142.5	116.2	109.8	122.7	103.4	109.8	113.0	109.8	91.2
14	80.0	82.8	85.5	142.5	116.2	109.8	122.7	103.4	109.8	113.0	109.8	91.2
15	80.0	82.8	85.5	156.6	116.2	109.8	122.7	103.4	109.8	113.0	109.8	91.2
16	80.0	82.8	85.5	178.9	116.2	109.8	122.7	103.4	109.8	109.8	109.8	91.2
17	80.0	80.0	88.3	178.9	116.2	109.8	122.7	103.4	109.8	122.7	116.2	91.2
18	80.0	80.0	85.5	178.9	116.2	109.8	122.7	103.4	109.8	132.5	109.8	91.2
19	80.0	80.0	85.5	178.9	116.2	109.8	122.7	103.4	109.8	129.2	109.8	91.2
20	80.0	80.0	85.5	171.2	116.2	109.8	122.7	109.8	109.8	129.2	109.8	94.2
21	80.0	80.0	91.2	171.2	116.2	109.8	122.7	109.8	109.8	129.2	109.8	91.2
22	80.0	80.0	91.2	171.2	116.2	109.8	129.2	106.6	109.8	129.2	109.8	91.2
23	80.0	80.0	129.2	163.8	116.2	116.2	129.2	103.4	109.8	129.2	109.8	91.2
24	80.0	80.0	116.2	163.8	116.2	103.4	122.7	103.4	109.8	129.2	109.8	91.2
25	80.0	80.0	116.2	163.8	116.2	103.4	122.7	116.2	109.8	129.2	109.8	91.2
26	80.0	80.0	91.2	163.8	116.2	103.4	103.4	119.4	109.8	129.2	109.8	91.2
27	80.0	80.0	91.2	149.5	116.2	103.4	103.4	109.8	109.8	129.2	109.8	91.2
28	80.0	80.0	91.2	135.8	116.2	103.4	103.4	116.2	109.8	132.5	109.8	91.2
29	80.0	......	91.2	135.8	116.2	97.2	103.4	116.2	109.8	132.5	109.8	91.2
30	82.8	......	103.4	135.8	116.2	97.2	103.4	116.2	109.8	129.2	103.4	91.2
31	85.5	......	97.2	......	116.2	......	103.4	109.8	......	129.2	......	91.2
Mean	80.2	81.8	91.9	149.8	116.4	109.0	112.0	108.2	113.4	122.7	113.0	91.4

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[a] Areas given taken from proceedings in condemnation of water powers on Skaneateles Outlet. The lake and its tributary are shown on the Skaneateles, Tully, Cortland, and Moravia quadrangles, U. S. Geol. Survey Topographic map.

Estimated Monthly Discharge of Skaneateles Outlet at Willow Glen Weir,[a] *Willow Glen, N.Y.*

[Drainage area 74 square miles.]

MONTH.	ACTUAL DISCHARGE IN SECOND-FEET.			ACTUAL RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January	85.5	80.0	80.2	1.08	1.25
February	85.5	80.0	81.8	1.10	1.14
March	129.2	80.0	91.9	1.24	1.43
April	178.9	91.2	149.8	2.02	2.25
May	122.7	116.2	116.4	1.57	1.81
June	116.2	97.2	109.0	1.47	1.64
July	129.2	97.2	112.0	1.51	1.74
August	122.7	103.4	108.2	1.46	1.68
September	129.2	109.8	113.4	1.53	1.71
October	149.5	109.8	122.7	1.66	1.91
November	122.7	103.4	113.0	1.52	1.70

Estimated Monthly Discharge of Skaneateles Outlet at Willow Glen Weir, Willow Glen, N.Y.*

[Drainage area, 74 square miles.]

MONTH.	Mean discharge, second-feet.	RUN-OFF.	
		Second-feet per square mile.	Depth in inches.
1902.			
October	136.4	1.84	2.12
November	131.6	1.78	1.99
December	103.2	1.39	1.60
1903.			
January	99	1.33	1.53
February	100.4	1.37	1.42
March	111.8	1.50	1.73
April	168.2	2.27	2.53
May	136.4	1.84	2.12
June	129.2	1.74	1.94
July	132.0	1.78	2.05
August	128.2	1.73	1.99
September	132.8	1.79	2.00
October	143.0	1.93	2.23

[a] Actual flow in outlet not including diversion.

* Including diversion for water supply of Syracuse.

ONEIDA RIVER AT SCHROEPPEL'S BRIDGE, EUCLID P. O., ONONDAGA COUNTY, N. Y.

Oneida Lake has a water surface area of 80 square miles and lies at elevation 370 feet above tide. The drainage basin within a radius of ten miles to the south and west is relatively flat, with numerous marshy tracts. The lake receives through Chittenango and Oneida Creeks, drainage from an extensive area of the Central New York plateau, and through Wood and Fish Creeks on the east, drainage from a portion of the west slope of the plateau bordering the Adirondack mountains. On the north the drainage area is less extensive and the inflowing streams are small.

The outflow from the lake through Oneida River, 16 miles in length, joins Seneca River at Three River Point, forming Oswego River, which is tributary to Lake Ontario. Observations of the stream stage have been taken by measuring down to water surface each morning and evening from a reference point on the bulkhead coping of the lock at the Oak Orchard State Dam 0.4 mile above Schroeppel's Bridge. Flashboards placed on the dam during the low-water season of 1903 have modified the stage during the period when they are in use.

A calibration curve for the cross-section of the stream at Schroeppel's Bridge has been obtained by current meter measurements. The gauge readings have been taken above the dam, as stated, to avoid the possibility of backwater which may arise from a number of causes.

The gauging station is seven miles upstream from Three River Point. The observations are taken by Arthur McArthur. The drainage area above the gauging station has been taken provisionally at 1,400 square miles.[a] [b]

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[a] From Bien's Atlas of New York. A portion of the drainage area is shown on the Syracuse, Chittenango, Oneida, Oriskany, Morrisville, Cazenovia and Tully quadrangles, U. S. Geol. Survey Topographic map.

[b] For additional data concerning Oneida River, see Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor for New York, 1902, pp. 82-84.

Oneida River: Dam at Oak Orchard, Onondaga County, N. Y.

Mean Daily Discharge, Second Feet, Oneida River, Schroeppel's Bridge, Euclid P. O., N. Y. [a]

DAY.	Jan.[b]	Feb.[b]	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
1	......	......	......	......	......	......	......	......	2,070	1,500	2,140	2,230
2	......	......	......	......	......	......	......	......	2,070	1,500	2,210	2,230
3	......	......	......	......	......	......	......	......	2,070	1,500	2,140	2,300
4	......	......	......	......	......	......	......	......	1,920	1,500	2,140	2,370
5	......	......	......	......	......	......	......	......	1,780	1,570	2,140	2,300
6	......	......	......	......	......	......	......	......	1,920	1,450	2,140	2,230
7	......	......	......	......	......	......	......	......	1,920	1,500	2,070	2,230
8	......	......	......	......	......	......	......	......	1,920	1,500	2,210	1,870
9	......	......	......	......	......	......	......	......	1,920	1,640	2,140	2,080
10	......	......	......	......	......	......	......	......	1,850	1,640	2,070	2,300
11	......	......	......	......	......	......	......	......	1,780	1,640	2,140	2,300
12	......	......	......	......	......	......	......	......	1,780	1,640	2,070	2,370
13	......	......	......	......	......	......	......	......	1,780	1,570	2,070	2,370
14	......	......	......	......	......	......	......	......	1,640	1,450	2,140	2,370
15	......	......	......	......	......	......	......	......	1,640	1,500	2,070	2,370
16	......	......	......	......	......	......	......	......	1,640	1,500	2,070	2,370
17	......	......	......	......	......	......	......	......	1,640	1,500	2,210	2,370
18	......	......	......	......	......	......	......	......	1,640	1,500	2,200	2,540
19	......	......	......	......	......	......	......	......	1,640	1,570	2,140	2,630
20	......	......	......	......	......	......	......	......	1,640	1,640	2,140	2,880
21	......	......	......	......	......	......	......	......	1,500	1,640	2,000	3,050
22	......	......	......	......	......	......	......	......	1,450	1,640	1,920	3,140
23	......	......	......	......	......	......	......	......	1,400	1,780	2,000	3,420
24	......	......	......	......	......	......	......	......	1,500	1,780	2,070	3,720
25	......	......	......	......	......	......	......	......	1,500	1,640	2,070	3,830
26	......	......	......	......	......	......	......	......	1,500	1,920	2,070	4,030
27	......	......	......	......	......	......	......	......	1,500	1,710	2,000	3,830
28	......	......	......	......	......	......	......	......	1,400	1,780	1,920	3,930
29	......	......	......	......	......	......	......	......	1,400	1,780	2,000	3,930
30	......	......	......	......	......	......	......	2,210	1,400	2,070	2,000	3,930
31	......	......	......	......	......	......	......	2,140	......	2,070	......	3,720
Mean	......	......	......	......	......	......	......	......	1,694	1,633	2,008	2,814
1903.												
1	3,320	4,230	5,720	12,160	3,670	1,570	2,380	1,500	1,400	1,090	3,460	2,380
2	3,140	4,030	6,460	12,010	4,410	1,500	2,140	1,500	1,350	1,090	3,460	2,380
3	3,140	4,130	6,710	11,860	4,410	1,500	2,290	1,400	1,350	1,090	3,260	2,290
4	3,620	5,350	7,100	11,860	3,970	1,500	2,290	1,500	1,400	1,090	3,260	2,210
5	3,830	5,600	7,360	11,560	3,770	1,500	2,290	1,400	1,350	1,090	3,060	2,070
6	3,830	6,460	7,360	11,410	3,560	1,500	2,290	1,450	1,350	1,190	2,890	2,070
7	3,840	5,960	7,360	11,260	3,360	1,450	2,290	1,500	1,350	1,240	2,890	2,070
8	3,830	6,580	8,420	11,260	3,260	1,450	2,290	1,400	1,350	1,450	2,720	2,070
9	4,130	7,750	8,970	11,260	3,060	1,400	2,140	1,500	1,350	1,850	2,720	2,070
10	5,350	6,460	9,240	11,110	3,060	1,350	2,070	1,450	1,350	2,380	2,800	1,920
11	5,720	5,840	10,380	10,960	2,890	1,400	2,070	1,450	1,190	2,890	2,890	1,850
12	6,710	5,720	10,810	10,810	2,800	1,450	2,000	1,450	1,240	3,060	2,720	1,780
13	7,100	5,960	11,260	10,520	2,630	1,570	1,920	1,450	1,190	3,160	2,783	1,450
14	6,090	6,210	11,560	10,660	2,550	1,570	1,780	1,400	1,190	3,460	2,783	1,460
15	5,350	5,840	11,560	10,230	2,470	1,570	1,570	1,450	1,190	3,460	2,630	1,610
16	4,680	5,720	11,560	9,670	2,470	1,570	1,500	1,450	1,190	3,670	2,890	1,730
17	4,130	5,470	11,560	9,240	2,380	1,570	1,500	1,350	1,190	3,670	2,470	1,870
18	3,720	7,880	11,560	8,700	2,290	1,570	1,780	1,240	1,190	3,670	2,290	1,940
19	3,720	9,100	11,410	8,290	2,210	1,640	1,640	1,240	1,190	4,180	2,380	2,010
20	3,620	9,240	11,260	8,020	2,140	1,710	2,140	1,190	1,190	4,180	2,630	2,010
21	3,620	9,240	11,260	7,620	2,070	1,920	1,500	1,190	1,190	3,870	2,720	2,010
22	3,720	8,420	11,260	7,230	1,570	2,210	1,450	1,240	1,190	3,870	2,720	2,080
23	3,930	6,970	12,640	6,840	2,070	2,550	1,500	1,350	1,140	3,770	2,630	2,080
24	4,130	5,240	13,440	6,460	2,070	2,800	1,450	1,300	1,090	3,670	2,070	2,080
25	4,230	5,010	13,760	6,210	2,070	2,630	1,450	1,350	1,080	3,570	2,550	2,080
26	4,130	4,790	13,760	5,960	2,000	2,630	1,500	1,350	1,090	3,200	2,550	1,940
27	3,930	4,790	13,760	5,720	1,920	2,630	1,450	1,450	1,500	3,060	2,550	1,940
28	3,520	5,010	13,280	5,470	1,780	2,630	1,450	1,640	990	2,980	2,550	2,010
29	3,420	......	12,960	5,240	1,710	2,630	1,500	1,850	990	3,060	2,470	2,160
30	2,960	......	12,800	4,680	1,570	2,630	1,570	1,640	1,090	3,260	2,380	2,230
31	3,320	......	12,640	......	1,500	......	1,500	1,450	......	3,460	......	2,370
Mean	4,186	6,179	10,619	9,143	2,635	1,853	1,829	1,422	1,230	2,800	2,712	2,007

[a] Low water discharge subject to revision.
[b] Approximate.

Estimated Monthly Discharge of Oneida River, Schroeppel's Bridge, Euclid P. O., N. Y.[a]
[Drainage area 1,400 square miles.]

MONTH.	Discharge in Second-Feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1902.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	....	....	....	....	....
June	....	....	....	....	....
July	....	....	....	....	....
August	....	....	....	....	....
September	2,070	1,400	1,694	1.21	1.35
October	2,070	1,450	1,633	1.17	1.35
November	2,290	1,920	2,093	1.49	1.66
December	4,030	1,870	2,814	2.01	2.32
1903.					
January	7,100	2,960	4,186	2.99	[b] 3.45
February	9,240	4,030	6,179	4.41	[b] 4.59
March	13,760	5,720	10,619	7.58	8.74
April	12,160	4,680	9,143	6.53	7.28
May	4,410	1,500	2,635	1.88	2.17
June	2,800	1,350	1,853	1.32	1.47
July	2,380	1,450	1,829	1.31	1.51
August	1,850	1,190	1,422	1.02	1.18
September	1,500	990	1,230	.88	.98
October	4,180	1,090	2,800	2.00	2.31
November	3,460	2,070	2,712	1.94	2.16
December	2,380	1,450	2,007	1.43	1.65
The year	....	....	....	....	37.49

Current Meter Discharge Measurements, Oneida River, at Schroeppel's Bridge, N. Y.

DATE.	Hydrographer.	Gauge height feet.	Discharge second-feet.
1903			
March 6	C. C. Covert	[c] 1.70	7,430
March 7	C. C. Covert	[c] 1.63	7,462
April 28	C. C. Covert	[c] 2.40	5,585
May 6	C. C. Covert	[c] 3.25	3,818
May 9	H. H. Halsey	[c] 3.40	3,232
May 12	R. E. Horton	[c] 3.56	2,897
May 16	H. H. Halsey	[c] 3.80	2,515
May 16	H. H. Halsey	[c] 3.80	2,538
June 25	H. H. Halsey	[c] 3.15	2,649
June 26	H. H. Halsey	[c] 3.15	2,618
Sept. 25	H. H. Halsey	[c] 4.20	1,070
Sept. 25	H. H. Halsey	[c] 4.25	1,043

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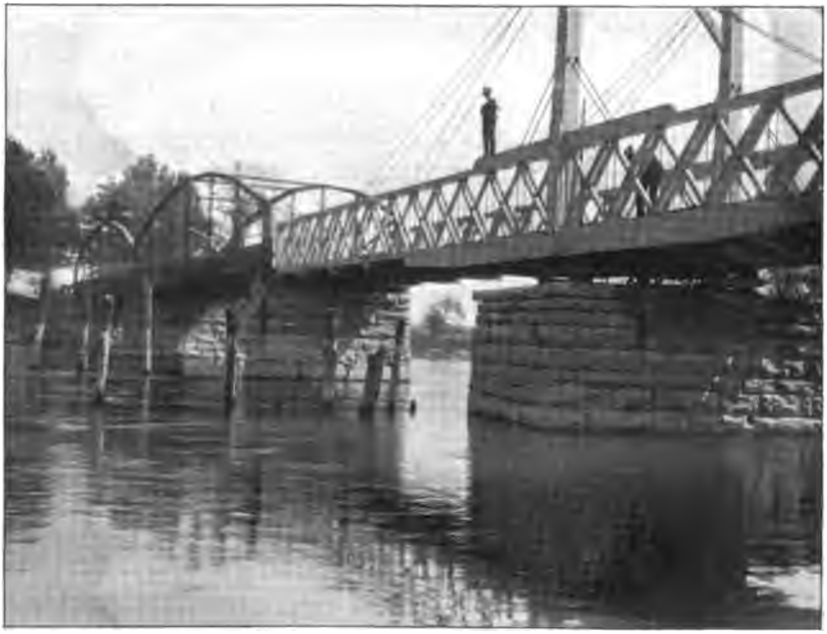
[a] Low water discharge subject to revision.
[b] Record possibly in excess owing to ice.
Rainfall omitted owing to lack of stations in region of greatest precipitation.
[c] Distance below top of coping at upper end of lock of dam 0.4 mile above bridge.



Oneida River at Schroeppel's Bridge, Euclid P. O., Onondaga County, N. Y.

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SENECA RIVER AT BALDWINSVILLE, ONONDAGA COUNTY, N. Y.

This station was established November 12, 1898.[a] The gauging station is located at the State dam in Baldwinsville, 12 miles along river from the junction of Seneca River with Oneida River. These two streams unite at Three River Point to form Oswego River.

Seneca River receives the drainage from the central group of lakes lying southward from Lake Ontario. The drainage basin is rolling, though not precipitous, excepting for the deep, narrow valleys crossing it in which the lakes are situated, and certain additional valleys not at the present time occupied by lakes.

The location of the gauging station is shown on the Baldwinsville Sheet, United States Geological Survey Topographic map. The topographic maps also show the entire drainage basin, and from them the drainage areas given in the accompanying table have been deduced.

Current meter measurements, to determine the leakage of the several mills, have been made during 1903, the necessary allowance for leakage having been found larger than as formerly estimated. The record has also been checked by current meter measurements made during 1901 and 1903 at Belgium and Jack's Reef. The discharge at New Bridge, Belgium, June 27, 1903, was 3817 second feet.

The gauging record at Baldwinsville includes the discharge over the main dam, which is calculated by the formula for a broad, flat-crested weir when flashboards are removed. Discharge over flashboards is calculated by the Francis formula. Gauge readings in the river channel below the dam are utilized to determine the average working head on turbines. Discharge through the three main canals is determined from records of the run of water wheels kept in each mill, and from the recorded lockage and opening of paddles at the Oswego Canal lock at the foot of the canal.

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[a] By George W. Rafter for U. S. Board of Engineers on Deep Waterways.

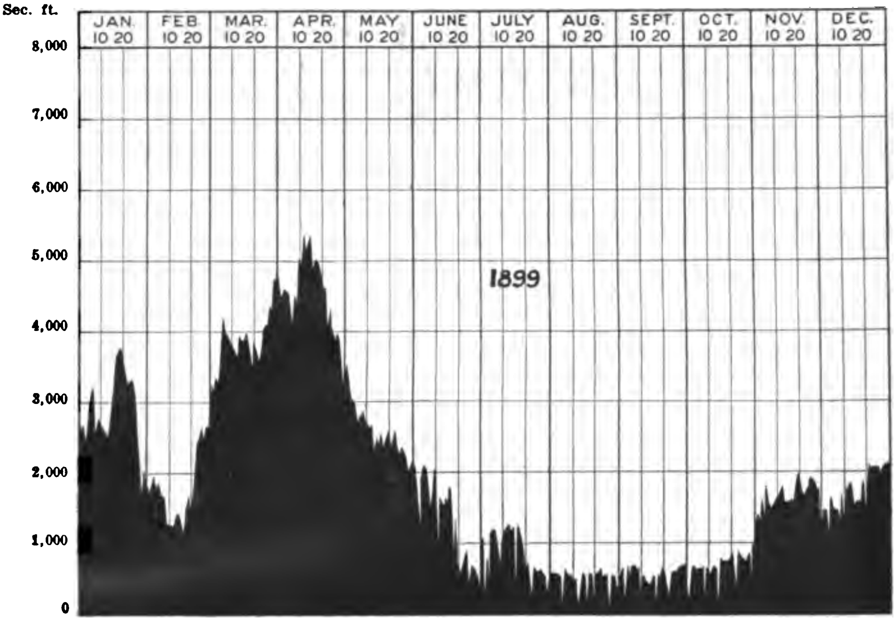
Mean Daily Discharge, Second-feet, Seneca River, at Baldwinsville, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	3,430	4,450	4,690	9,080	5,870	2,890	3,330	1,310	2,660	2,470	4,390	3,860
2	3,380	5,680	5,900	8,850	5,850	2,700	3,100	1,020	2,860	2,470	5,110	3,650
3	3,710	5,510	6.050	8,920	4,630	2,630	2,960	2,690	3,080	2,510	4,880	3,660
4	3,310	6,060	6,070	9,100	5,780	2,700	2,250	1,710	3,240	2,000	4,770	3,530
5	4,530	6.340	6,520	8.070	5.540	2,600	2,180	1.550	3,290	2,610	4,560	3,420
6	4,770	6,680	6,760	8,800	5,310	2,520	2,850	1.530	2,890	2,590	4,440	3,140
7	4,660	6,660	6,820	9,110	5,290	1,550	2,780	1,610	3,190	2,590	4,350	3,510
8	4,590	5,240	6,170	9,220	5,200	2,810	2,950	2,000	3,250	2,800	3,910	3,280
9	4,210	6,610	7,370	9,190	5,100	2,670	2,850	1,710	3,270	3,000	4,530	3,090
10	3,880	6,400	7,220	9,360	4,120	2,560	2,830	2,030	3,230	3,370	4,440	2,960
11	3,030	6,350	7,540	9,000	5,110	2,520	2,520	1,960	3,250	3,450	4,330	2,840
12	3,080	6,300	7,660	8,370	4,870	2,680	1,910	1,950	3,320	4,250	4,440	2,820
13	2,350	6,530	7,800	8,890	4,850	2,770	2,300	2,010	2,830	4,360	4,440	2,890
14	2,710	6,360	7,870	8,660	4,630	1,820	2,150	1,840	2,790	4,430	4.050	4,750
15	2,890	5,280	7,000	8,520	4,510	3,240	1,870	1,770	3,060	4,480	3,640	2,770
16	2,890	5,740	8,290	8,440	4,350	3,000	1,770	1.370	3,170	4.450	3,860	2,200
17	3,100	4,200	7,970	8,300	3.170	3,000	1,870	1,920	3,000	4.620	3,900	2,130
18	2,490	4,430	8,000	8,170	4,280	3,000	1,500	1,730	3,280	4,340	4,320	2,140
19	3,060	3,800	7,990	7,820	3,960	2,840	1,270	1,760	3,050	5,200	4,560	2,150
20	2,950	4,180	7,590	8,010	3,930	2,210	1,870	1,940	2,810	5,210	4,370	2,010
21	3,050	4,100	7,570	7,750	3,790	1,930	1,840	2,030	3,250	5,210	4,370	2,170
22	2,940	3,530	6,710	7,600	3,990	2,480	1,770	1,950	3,160	5,210	3,880	2.600
23	3,080	4.490	7,990	7,520	3,690	2,520	1,780	1,450	3,080	5,320	4,420	2,780
24	2,920	4,230	8,520	7,280	2,540	2,710	1,700	2,130	2,870	5,290	4,440	2,770
25	2,560	4,770	8,790	6,790	3,800	3,260	1,470	1,860	2,650	4,860	4,380	2,840
26	3,450	4,630	8,910	5,700	3,270	3,490	1,260	1,930	2,590	5,450	3,910	2,940
27	3.170	4.760	9,060	6.510	3,210	3,570	1,770	1,940	2,530	5,070	4,330	2,440
28	3,170	5,390	8,850	6.140	3,000	3,090	1,380	1,990	2,670	5,040	3,870	2,150
29	3,390	......	8,100	6,220	2,180	3,530	1,410	1,810	2,520	5,070	3,410	2,020
30	4,620	......	9,140	6,080	2,400	3,490	1,590	1,570	2,430	4,810	3,810	2,090
31	4,860	......	9,010	......	1,740	......	1,510	2,310	......	4,800	......	2,230
Mean	3,427	5,311	7,546	8,051	4,194	2,759	2,084	1,819	2,976	4,109	4,277	2,837

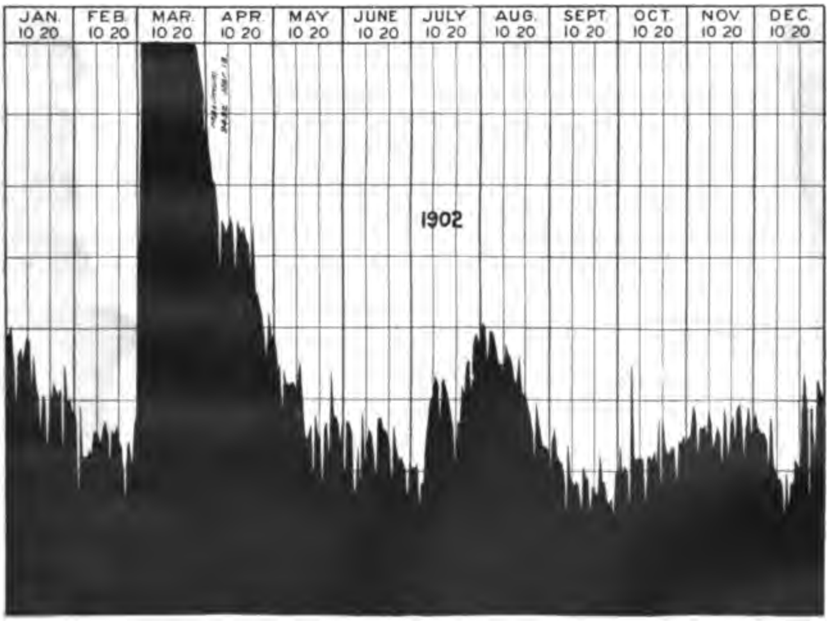
Estimated Monthly Discharge of Seneca River, at Baldwinsville, N. Y.

[Drainage area 3,103 square miles.]

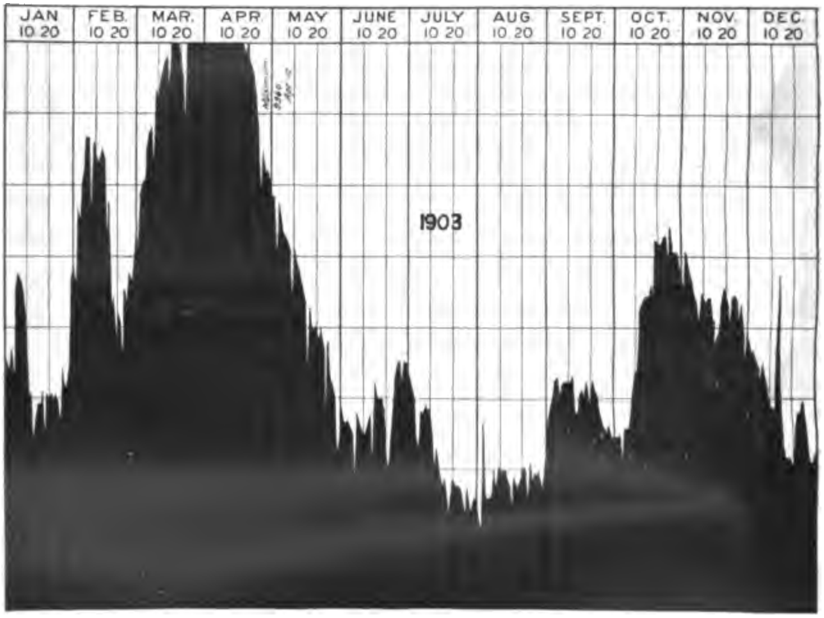
MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January	**4,860**	**2,350**	**3,427**	**1.10**	**1.27**
February	**6,680**	**3,530**	**5,311**	**1.71**	**1.78**
March	**9,140**	**4,690**	**7,546**	**2.43**	**2.80**
April	**9,360**	**5,700**	**8,051**	**2.59**	**2.89**
May	**5,870**	**1,740**	**4,194**	**1.35**	**1.56**
June	**3,570**	**1,550**	**2,759**	**.89**	**.99**
July	**3,330**	**1,260**	**2,084**	**.67**	**.77**
August	**2,690**	**1,020**	**1,819**	**.59**	**.68**
September	**3,320**	**2,430**	**2,976**	**.96**	**1.07**
October	**5,450**	**2,000**	**4,109**	**1.32**	**1.52**
November	**5,110**	**3,410**	**4,277**	**1.38**	**1.54**
December	**4,750**	**2,010**	**2,837**	**.91**	**1.05**
The year	....	....	....	....	**17.92**



Discharge of Seneca River at Baldwinsville, Onondaga County, N. Y., 1899.



Discharge of Seneca River at Baldwinsville, Onondaga County, N. Y., 1902.



Discharge of Seneca River at Baldwinsville, Onondaga County, N. Y., 1903.

OSWEGO RIVER AT BATTLE ISLAND, OSWEGO COUNTY, N. Y.

Oswego River is formed by the confluence of Oneida and Seneca Rivers, at Three River Point. The stream is shown throughout its course of 24 miles on the Oswego Special and Baldwinsville quadrangles, United States Geological Survey Topographic map. The drainage tributary to the river below the junction of Oneida and Seneca Rivers is of small extent. The tributaries are neither large nor numerous, receiving the drainage from a number of small lakes and marshes in a moderately rolling basin. Oneida and Seneca Rivers are both notable for a large extent of lake and marsh area which they contain; Oneida Lake in the former, and the Finger Lakes tributary to the latter stream affording extensive natural storage regulation of flow to Oswego River.

A fall of 100 feet in the course of Oswego River is mainly utilized by seven dams, which also partially canalize the stream. The intervening stretches are covered by the Oswego Canal, which draws its water supply from the river. The accompanying tables of daily discharge show the actual flow past the gauging station, not including the flow in Oswego Canal.[a]

Current-meter Discharge Measurements of Oswego River at Battle Island cable-station, near Minetto, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1903.			
March 13	C. C. Covert	3.825	19,192
May 19	H. H. Halsey	1.20	6,282

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[a] For additional data of gaugings of Oswego River, see report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor of New York for 1902, pp. 84-96. A description of Seneca River is given in the same report, pp. 76-81.

** Mean Daily Discharge, Second-feet, Oswego River, Battle Island, N. Y.*

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	8,590	13,690	19,000	10,020	4,290	6,360	3,210	4,510	4,030	8,290	7,200
2	11,930	8,690	14,590	18,860	9,610	3,690	6,170	2,420	4,660	3,930	9,090	7,060
3	10,120	8,490	14,250	18,670	9,400	3,720	5,560	3,860	4,980	3,590	9,090	6,630
4	9,710	8,490	14,360	19,000	9,860	3,400	4,740	3,400	4,900	2,860	8,850	6,580
5	9,710	8,690	14,470	18,420	9,200	3,400	5,050	3,590	4,900	3,270	8,790	6,450
6	9,500	8,790	15,220	18,670	8,990	3,140	6,210	3,490	3,790	4,000	8,790	6,450
7	9,500	9,090	15,040	18,570	8,590	2,580	5,640	3,530	5,050	4,290	8,690	6,690
8	9,500	9,300	14,930	18,550	8,290	4,000	5,380	3,210	4,930	3,340	8,090	7,100
9	9,300	9,090	17,350	18,800	8,590	3,270	5,560	2,740	4,660	5,560	8,890	7,000
10	9,300	9,300	16,870	18,670	7,490	3,310	5,260	4,740	4,710	6,820	8,590	6,360
11	9,500	9,500	17,600	18,300	8,190	3,210	4,820	3,860	4,900	7,100	7,850	6,450
12	9,500	9,710	17,350	17,950	7,450	3,400	3,890	3,720	4,510	7,590	7,990	6,210
13	9,400	9,710	17,600	17,950	7,200	3,620	4,260	3,660	3,720	9,400	7,650	5,180
14	9,300	9,920	17,710	17,350	6,820	3,140	4,220	3,590	5,050	9,400	7,490	4,220
15	9,300	9,920	17,830	17,350	6,590	4,740	4,000	3,440	4,590	9,400	6,850	5,020
16	9,200	10,120	17,600	17,230	6,360	4,220	3,700	2,690	4,820	9,400	8,490	5,470
17	9,090	10,120	17,830	16,870	5,940	4,320	3,660	4,070	4,430	9,300	7,790	5,050
18	9,090	10,230	17,350	16,170	6,260	3,880	3,660	3,460	4,660	9,960	7,790	5,470
19	8,890	10,330	17,160	15,600	5,690	4,000	3,210	3,340	4,360	11,500	7,990	5,050
20	8,690	10,540	16,990	15,720	5,470	3,790	3,460	3,590	3,530	10,750	8,190	5,560
21	8,590	10,960	16,990	15,040	5,060	3,340	3,460	3,590	4,360	10,750	7,850	6,630
22	8,490	11,230	16,870	14,590	4,780	4,900	3,530	3,400	4,150	10,710	7,690	7,000
23	8,390	11,170	18,940	14,300	4,460	5,130	3,620	2,540	4,080	10,750	8,330	7,790
24	8,290	10,750	19,950	13,690	4,150	5,910	3,590	3,660	3,660	10,230	8,050	6,960
25	8,090	10,850	20,100	13,130	5,380	7,300	3,400	3,360	4,000	9,500	7,890	6,170
26	8,090	11,230	19,950	12,370	4,510	7,490	2,580	3,460	3,590	10,160	8,090	6,500
27	8,290	10,750	19,470	12,590	4,290	7,400	4,000	3,400	3,140	9,670	7,930	6,720
28	8,090	12,260	19,470	11,870	4,290	6,260	3,110	3,530	3,860	9,810	7,890	6,910
29	8,090	......	19,240	11,500	3,570	7,490	3,340	4,000	3,690	9,670	6,820	7,400
30	8,690	......	19,350	11,000	3,400	6,540	3,340	3,790	3,860	9,610	7,790	7,490
31	8,590	......	19,350	......	2,880	......	2,910	4,220	......	9,460	......	7,690
Mean	9,075	9,922	17,273	16,260	6,541	4,496	4,248	3,503	4,335	7,929.5	8,119.6	6,402

Estimated Monthly Discharge of Oswego River at Battle Island, N. Y.[a]

[Drainage area 4,990 square miles.]

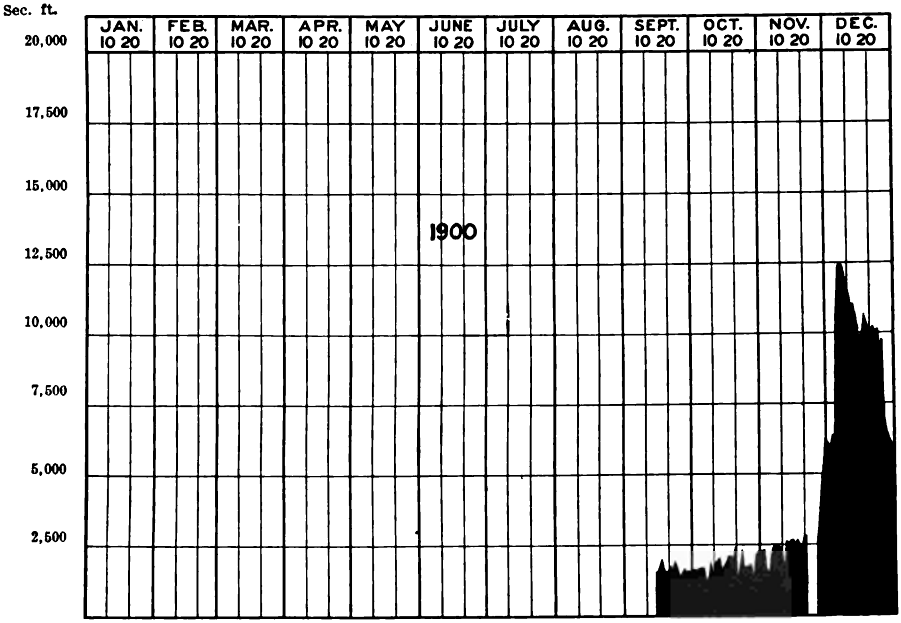
MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January	11,930	8,090	9,075	1.815	2.10
February	12,260	8,500	9,922	1.984	2.06
March	20,100	13,690	17,273	3.455	3.98
April	19,000	11,000	16,260	3.252	3.62
May	10,020	2,880	6,541	1.308	1.51
June	7,490	3,210	4,496	.899	1.00
July	6,360	2,580	4,248	.850	.98
August	4,070	2,420	3,503	.701	.81
September	5,050	3,140	4,335	.867	.97
October	11,500	2,860	7,930	1.586	1.83
November	9,090	6,810	8,120	1.624	1.81
December	7,790	4,220	6,402	1.280	1.48
The year	....	....	....	....	22.05

* Does not include flow through Oswego canal.

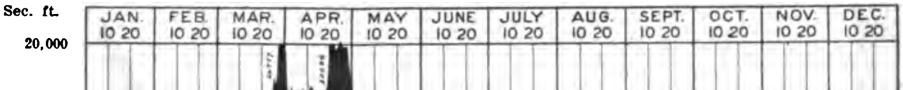
[a] Not including flow through Oswego canal.

Cable Station on Oswego River, eight miles from Lake Ontario, Oswego County, N. Y.

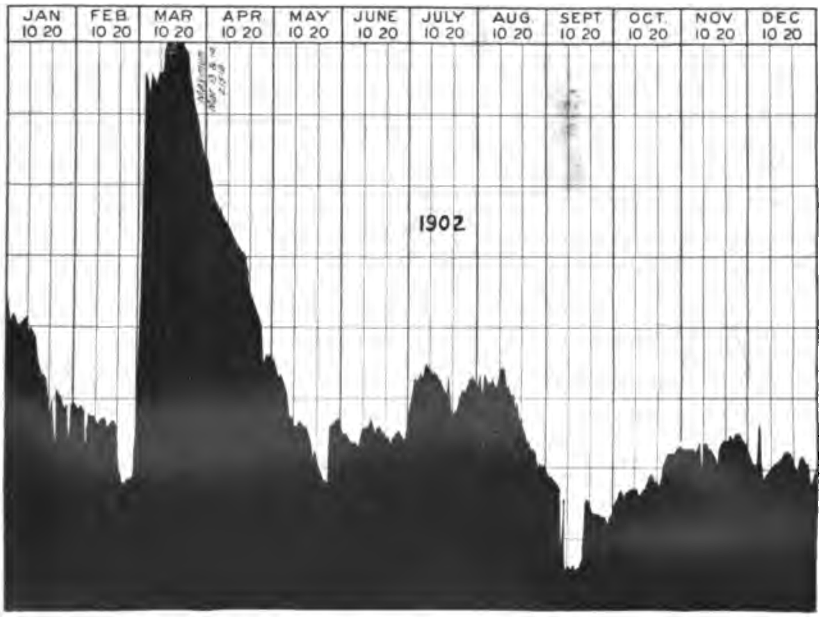
New York State High Dam on Oswego River, three miles from Lake Ontario, Oswego County, N. Y.



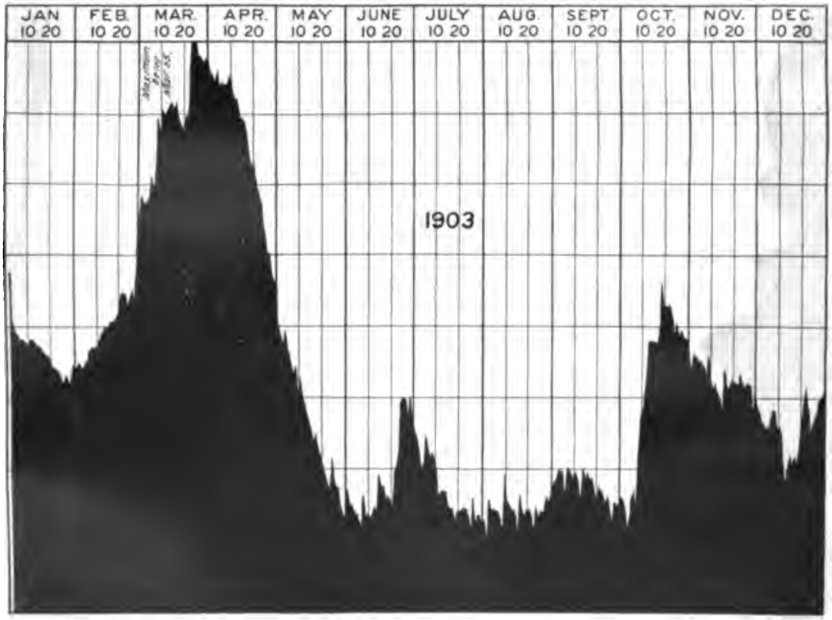
Discharge of Oswego River at Battle Island Cable-station, near Minetto, Oswego County, N. Y., 1900.



Discharge of Oswego River at Battle Island Cable-station, near Minetto, Oswego County, N. Y., 1901.



Discharge of Oswego River at Battle Island Cable-station, near Minetto, Oswego County, N. Y., 1902.



Discharge of Oswego River at Battle Island Cable-station, near Minetto, Oswego County, N. Y., 1903.

GENESEE RIVER AT ROCHESTER, MONROE COUNTY, N. Y.

During the low-water season of 1903, a series of current meter measurements were made in the Carroll & Fitzhugh, and Johnson & Seymour Raceways, which receive their water supply from the Johnson & Seymour Dam on Genesee River in Rochester. The stage of the water was below the crest of the dam at all times during the period while measurements were being taken, with the exception noted on the tables. The measurements were taken late in the afternoon or early in the morning, the water being drawn down to the minimum stage, and they therefore represent, as nearly as could be obtained, the natural low-water flow of the stream at this point. The Johnson & Seymour Dam is of masonry, practically water tight. It is located below the point of diversion from Genesee River to Erie Canal Feeder, and the pond above the dam receives only the water supply available to the extensive power development at the three falls on the river, which occur within the city limits.

A record of the daily stage of Genesee River in the pond, measured at a point 15 feet upstream from Johnson & Seymour Dam, has been kept, beginning March, 1893; a survey and profile of the dam have also been made. From this data, the high-water discharge can be calculated. The results have not yet been reduced.

In addition to the canal feeder mentioned, water is diverted from Allen Creek at Scottsville and brought down the abandoned Genesee Valley Canal for the supply of Erie Canal at Rochester. The water supply of the city of Rochester is also drawn from Hemlock Lake, the outlet of which is tributary to Genesee River.

Current-meter Discharge Measurements of Genesee River, at Rochester, N. Y.[a]

DATE.	Hydrographer.	FITZHUGH AND CARROLL.			JOHNSON AND SEYMOUR.			TOTAL.
		Gauge height. [b]	Elevation water surface.	Discharge, C. F. S.	Gauge height. [c]	Elevation water surface.	Discharge, C. F. S.	Discharge, C. F. S.
1903.								
July 23	C. C. Covert....	3.00	241.10	340	......	....	....	340
July 25	C. C. Covert....	......	....	....	4.24	241.08	306	306
July 27	C. C. Covert....	1.94	240.04	279	3.55	240.39	362	641
July 27	E. H. Fisher....	......	....	....	3.08	239.92	331	331
July 28	E. H. Fisher....	1.74	239.84	237	3.48	240.32	281	518
July 30	E. H. Fisher....	2.95	241.05	237	2.95	239.79	236	473
July 31	E. H. Fisher....	1.32	239.42	232	2.58	239.42	286	518
Aug. 1	E. H. Fisher....	......	....	....	2.78	239.62	305	305
Aug. 3	E. H. Fisher....	2.00	240.10	271	2.98	239.82	394	665
Aug. 12	E. H. Fisher....	3.45	241.55	350	3.92	240.76	428	778
Aug. 13	E. H. Fisher....	3.35	241.45	332	3.68	240.52	450	782
Aug. 14	E. H. Fisher....	2.90	241.00	371	3.98	240.82	450	821
Aug. 15	E. H. Fisher....	2.45	240.55	245	3.48	240.32	373	618
Aug. 17	E. H. Fisher....	1.50	239.60	278	2.82	239.66	383	661
Aug. 18	E. H. Fisher....	1.08	239.18	214	2.40	239.24	298	512
Aug. 19	E. H. Fisher....	0.68	238.78	268	2.18	239.02	278	546
Aug. 20	E. H. Fisher....	0.82	238.92	276	3.32	240.16	282	558
Aug. 21	E. H. Fisher....	3.30	241.40	383	4.10	240.94	428	811
Aug. 22	E. H. Fisher....	3.22	241.32	271	3.98	240.82	396	667
Sept. 24	E. H. Fisher....	1.60	239.70	343	2.78	239.62	295	638
Sept. 26	E. H. Fisher....	1.20	239.30	208	2.38	239.22	245	453
Sept. 29	E. H. Fisher....	0.30	238.40	273	1.98	238.82	206	479
Sept. 30	E. H. Fisher....	0.55	238.65	258	2.15	238.99	240	498
Oct. 2	E. H. Fisher....	0.12	238.22	252	1.95	238.79	232	484
Oct. 3	E. H. Fisher....	0.88	238.98	241	1.98	238.82	208	449
Oct. 5	E. H. Fisher....	2.95	241.05	347	3.98	240.82	339	686
Oct. 6	E. H. Fisher....	......	....	....	3.90	240.74	264	264
Oct. 30	E. H. Fisher....	2.05	240.15	364	3.10	239.94	312	676
Oct. 31	E. H. Fisher....	1.60	239.70	350	3.35	240.19	318	668
Nov. 2	E. H. Fisher....	1.72	239.82	363	3.45	240.29	252	615
Nov. 3	E. H. Fisher....	1.50	239.60	320	3.35	240.19	314	634
Nov. 4	E. H. Fisher....	0.65	238.75	299	2.20	239.04	202	501
Nov. 9	E. H. Fisher....	3.45	241.55	142	......	....	....	142
Nov. 10	E. H. Fisher....	......	....	....	4.20	240.04	404	404
Nov. 13	E. H. Fisher....	3.35	241.45	256	......	....	....	256

GENESEE RIVER AT JONES BRIDGE NEAR MT. MORRIS, LIVINGSTON COUNTY, N. Y.

A current meter gauging station was established at this point May 22, 1903. Observations of the stream stage are taken each morning and evening by J. T. Trewer, observer. The discharge measurements are made from a footbridge erected on the outriggers of the downstream side of the highway bridge, which consists of two spans of 174.3 and 31.7 feet respectively. A weight and chain gauge 15.5 feet in length is secured to the truss uprights near the center of the main bridge span on the upstream side. The bench mark is corner of wing wall left-hand abutment

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[a] Pond filled during night and water flowed over dam in morning during periods of measurement only between July 25 and 27 and Aug. 5 and 14 inclusive.

[b] Elevation gauge zero 238.10 city datum.

[c] Elevation gauge zero 236.84 city datum.

Genesee River: Gauging Station at Jones' Bridge, below Mt. Morris, Livingston County, N. Y.

upstream side. Assumed elevation, 100.00. Elevation datum plane of gauge, 69.64 feet.

River channel is of clay and straight for several hundred feet below gauge. About 300 feet above the bridge is an abrupt bend. The location of the gauging station and the course of the river from Jones Bridge to its outlet into Lake Ontario near Rochester is shown on the Caledonia, Honeoye, and Rochester quadrangles, U. S. Geological Survey Topographic map. The gauging station is located a short distance below the inflow of Canaseraga Creek. The course of Genesee River below Mt. Morris is very winding, traversing from side to side a flood-plain 1½ miles average width.

Cuba Reservoir on the Genesee-Allegheny divide receives the drainage from a tributary area of 26.6 square miles. The storage volume is 454,000,000 cubic feet.[a] The overflow from this reservoir enters Allegheny River. The storage water may be turned into the summit level of the abandoned Genesee Valley Canal, and thence into Genesee River.

Current-meter Discharge Measurements of Genesee River, at Jones Bridge, near Mt. Morris, N. Y.

DATE.	Hydrographer.	Gauge height feet.	Discharge, second-feet.
1908.			
May 23	C. C. Covert.	4.66	311
May 23	C. C. Covert.	4.66	295
June 13.	H. H. Halsey	4.90	419
June 13.	H. H. Halsey	4.90	430
July 25.	C. C. Covert.	4.92	520
October 3.	H. H. Halsey	5.12	572

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[a] Including Rockville reservoir.

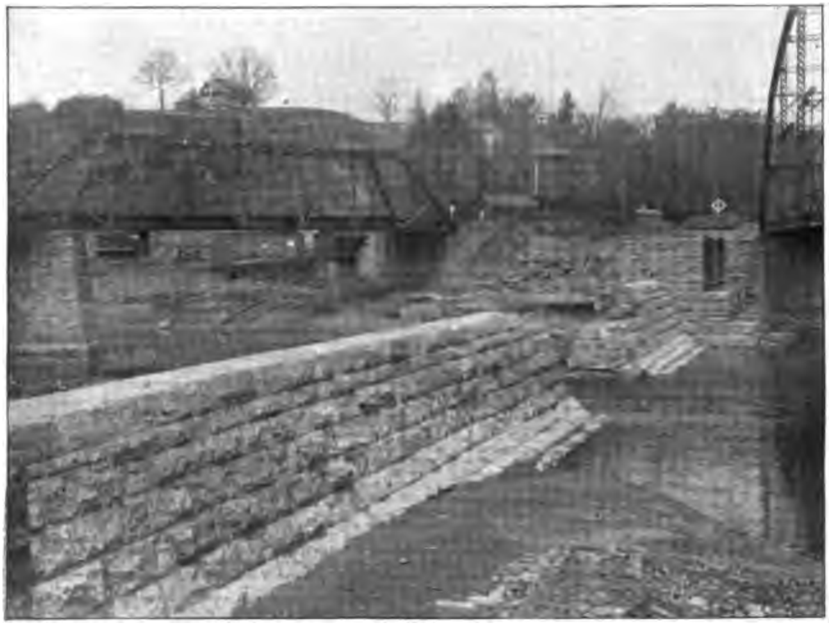
Mean Daily Gauge Height, Feet, of Genesee River at Jones Bridge, near Mt. Morris, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	4.50	5.50	4.02	9.07	4.52	4.72	5.42
2	......	......	......	......	......	4.45	5.15	4.87	7.82	4.57	4.72	5.32
3	......	......	......	......	......	4.45	5.00	4.67	6.82	5.17	4.72	5.07
4	......	......	......	......	......	4.45	4.95	4.82	6.22	4.97	4.62	5.02
5	......	......	......	......	......	4.45	4.95	8.62	5.72	4.87	4.72	5.02
6	......	......	......	......	......	4.45	5.15	8.37	5.47	7.07	4.77	5.07
7	......	......	......	......	......	4.35	5.95	6.82	5.32	5.87	5.07	4.87
8	......	......	......	......	......	4.35	5.35	6.12	5.27	5.52	4.87	4.92
9	......	......	......	......	......	4.40	5.00	5.67	4.52	13.52	4.87	4.92
10	......	......	......	......	......	4.55	4.85	5.57	4.32	8.82	4.77	4.82
11	......	......	......	......	......	4.65	4.75	5.47	5.47	7.37	4.82	4.87
12	......	......	......	......	......	4.80	4.75	5.17	7.17	7.12	4.72	4.67
13	......	......	......	......	......	4.85	4.75	5.07	5.87	6.52	4.72	5.02
14	......	......	......	......	......	4.90	4.75	4.92	5.37	6.02	4.72	6.87
15	......	......	......	......	......	4.85	4.65	4.77	5.27	5.72	4.72	7.67
16	......	......	......	......	......	4.80	4.65	4.62	5.02	5.52	4.82	7.42
17	......	......	......	......	......	4.80	4.60	4.57	5.32	5.42	9.17	7.32
18	......	......	......	......	......	4.80	4.55	4.52	6.57	5.37	14.22	7.17
19	......	......	......	......	......	4.70	4.62	4.52	6.02	6.47	9.47	6.92
20	......	......	......	......	......	4.65	5.02	5.92	5.37	5.92	7.72	6.82
21	......	......	......	......	......	5.20	4.97	5.27	5.12	5.52	7.12	6.62
22	......	......	......	......	4.70	6.75	5.02	5.12	5.02	5.32	6.67	6.67
23	......	......	......	......	4.70	6.05	5.27	4.82	4.82	5.22	6.32	6.52
24	......	......	......	......	4.60	7.10	5.67	4.62	4.72	5.12	6.72	6.52
25	......	......	......	......	4.55	6.95	5.12	5.02	4.02	5.12	6.57	6.42
26	......	......	......	......	4.60	7.90	4.87	5.02	4.57	5.02	6.17	6.47
27	......	......	......	......	4.60	6.80	4.77	4.77	4.42	4.97	5.72	6.52
28	......	......	......	......	4.70	5.95	4.62	4.67	4.52	4.92	5.62	6.72
29	......	......	......	......	4.80	5.70	4.62	16.07	4.57	4.97	5.62	6.62
30	......	......	......	......	4.80	5.70	4.52	13.57	4.42	4.87	5.02	6.72
31	......	......	......	......	4.65	......	4.57	10.67	......	4.87	......	6.57

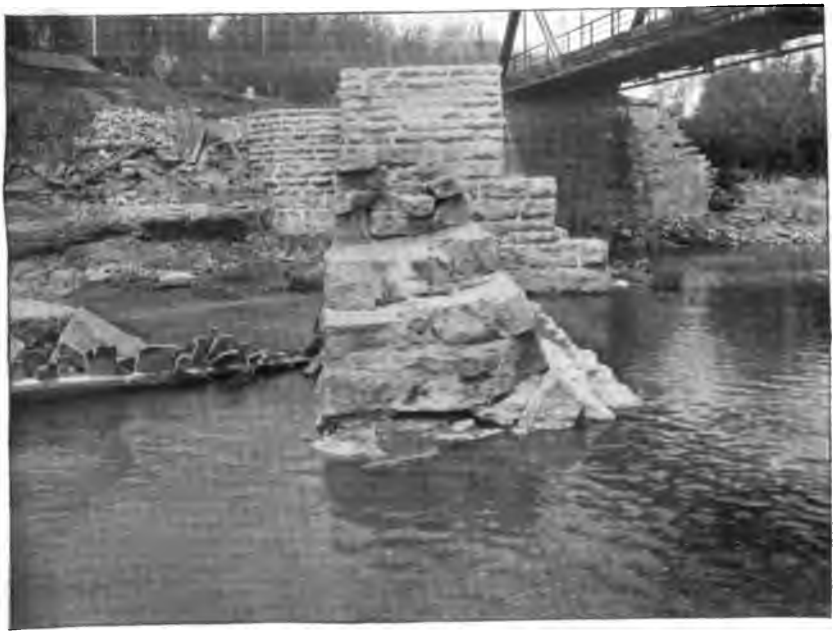
HONEOYE CREEK AT EAST RUSH, MONROE COUNTY, N. Y.

A gauging station was established on Honeoye Creek at Smith's Mill in the village of East Rush, February 13, 1903. The record includes the flow over the dam, which is of timber, having a crest varying somewhat in level 150.15 feet in length; also the discharge through two Leffel Standard turbines, one 48-inches, the other 35-inches diameter. A record is kept of the head on the turbines and the number of hours each runs per day and the average gate opening. The latter is obtained by noting the number of gear teeth out of the total possible number through which the wheel gates stems may be turned to open the gates; allowance being made for lost motion. The bench mark on the window sill of the mill near flume is assumed at elevation 100.00; the gauges being set with their zero marks as below:

Crest gauge elevation	94.855
Tailrace gauge	87.380
Difference	7.475



Dam at Mt. Morris, Livingston County, N. Y., Before Completion, May, 1903.



Section of Dam at Mt. Morris, Livingston County, N. Y.
GENESEE RIVER, N. Y.

Honeoye Creek is the outlet of Honeoye Lake which forms one of a group of narrow parallel lakes similar to the Finger Lakes of the Seneca River Basin and located to the west of the latter. Honeoye Creek is joined four miles below its source by the combined outlet of Hemlock and Canadice Lakes, which enters Genesee River near Rochester Junction. This group of lakes have areas and elevations as indicated below:[a]

LOCATION.	Elevation.	Water surface area, square miles.	Drainage area, square miles.	Per cent. water surface.
Hemlock Lake	896	2.8	46.8	.0612
Canadice Lake	1,092	0.7	12.6	.0557
Honeoye Lake	800	2.5	39.6	.0641

Honeoye Creek enters Genesee River at Genesee Valley junction. The entire drainage area is approximately rectangular, having a length of 30 miles. Average width 9.5 miles. The fall of 280 feet in the course of the stream has been largely utilized by the construction of dams.

The lakes, which serve as natural reservoirs, have inlets draining considerable areas at their uppermost ends. The slopes adjacent to the lakes themselves are narrow and steep, and are drained by gulleys and torrential brooks. The area below the lakes is rolling, the soil rich and extensively cultivated. The stream tributaries are not numerous but ramify in such manner as to give good drainage of all portions of the area.

The diversion from Hemlock Lake by the city of Rochester is to be added to the measured run-off at East Rush to obtain the total yield of the drainage basin. This data is not available at the time of this writing. The average diversion rate is however about 22 cubic feet per second. The discharge at the gauging station in 1903 has not been calculated.

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[a] The drainage basin of Honeoye Creek is shown on the Honeoye, Canandaigua, Naples and Wayland quadrangles, U. S. Geol. Survey Topographic maps, from which the areas have been taken, with the exception of those for Hemlock and Canadice Lakes, which are from surveys of Rochester Waterworks.

Drainage Areas of Honeoye Creek.

	Place to place, square miles.	Total square miles.
Hemlock Lake, above outlet	46.8	....
Hemlock Lake Outlet, to Canadice Lake Outlet	.1	46.9
Canadice Lake, above outlet	12.6	....
Canadice Lake Outlet to Hemlock Lake Outlet	18.9	31.5
Junction of Hemlock and Canadice Lake Outlets	....	78.4
Hemlock Outlet, from junction to Honeoye Creek	15.6	94.0
Honeoye Lake, above outlet	39.6	....
Honeoye Creek, from lake outlet, to junction of Hemlock Outlet	31.7	71.3
Honeoye and Hemlock Outlets at junction	....	165
Honeoye Creek Junction, to Honeoye Falls	44.0	209
Honeoye Falls to East Rush	50.0	260
Honeoye Creek, East Rush, to mouth	28.0	288

HEMLOCK LAKE AT HEMLOCK, LIVINGSTON COUNTY, N. Y.

Above the point of gauging by the Rochester Water Department immediately below the foot of the lake, Hemlock Lake receives the drainage from an area 2½ miles wide and 7 miles in length, through the center of which lies the lake itself, together with that from a rectangular area 5 miles square tributary to the inlet stream at the head of the lake. The side slopes rise to an elevation 500 to 1,000 feet above the lake, in a distance of one to one and one-half miles on either side. These slopes give rise to very few perennial streams. The inlet at the head of the lake drains a dissected plateau tapped by numerous branching tributaries.[a]

One-third mile below the foot of the lake, the outlet is joined by that of Canadice Lake, and the combined stream enters Honeoye Creek after a course of five miles.

A record of the elevation of the water surface in the lake has been maintained by the Water Department of the city of Rochester, beginning June, 1876. The monthly mean elevations to the end of 1895 were given in the accompanying table.

It is stated that the outlet of the lake was retained in a uniform, natural condition for a long period prior to 1895.[b]

In 1895, a submerged weir was constructed in the outlet, forming a channel, the width of which could be varied at will. From

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[a] The drainage area is shown on the Honeoye and Wayland quadrangles, U. S. G. S. Topographic map.

[b] Report Department of Public Works, Rochester, N. Y., 1900, p. 139.

1895 to the present date, the rate of discharge at a given stage has depended upon the condition of this weir.

In 1860 a company was formed for the purpose of bringing a gravity water supply to Rochester from Hemlock Lake. In April, 1872, a board of Water Commissioners was created by the city of Rochester, rights of the original water company were obtained, and early in 1876 a conduit, consisting of 9.75 miles of 36-inch riveted wrought-iron pipe, and 18 miles of 24-inch cast-iron pipe was completed from Hemlock Lake to the Mount Hope distributing reservoir at Rochester.[a]

In October, 1894, a second conduit of 38-inch steel and 36-inch cast-iron pipe was completed.

In connection with gaugings of the Hemlock Lake Outlet, the diversion through these conduits has been determined by using the reservoir at Rush, located midway beween Hemlock Lake and Rochester, for a volumetric measure of the flow.[b]

In the following tables are given the estimated mean annual diversion since the completion of the first conduit; also the monthly mean diversion, beginning 1894, determined from the gaugings.

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[a] "The New Conduit of the Rochester Water works," by E. Kuichling, Annual Report Rochester Executive Board, 1894-5, pp. 307-339.

[b] The history and results of gauging of the conduits may be found in the following:

1 Report of J. T. Fanning and Alphonse Fteley, Consulting Engineers on Additional Water Supply, Rochester Executive Board, 1890, pp. 30 to 60.
2 Review and Discussion of the above-named report .by J. Nelson Tubbs, Chief Engineer, Rochester Water Works, Rochester Executive Board, 1890, pp. 63 to 94.
3 Rochester Executive Board, 1891, Report of Emil Kuichling on the Original and Present Discharging Capacity and Diminution in same, of the old Hemlock Lake Conduit, pp. 32-39.
4 Summary of Gaugings of the Old Hemlock Lake Conduit, Rochester Executive Board, 1894-5, page 169.
5 Comparison of the Original Computations and Actual Gaugings of the New Steel Conduit, Emil Kuichling, C. E., Report Rochester Executive Board, 1894-5, pp. 340-351.
6 Gaugings of the New Hemlock Lake Conduit, by E. Kuichling, Rochester Executive Board, 1897, pp. 41-44.
7 Gaugings of New Hemlock Lake Conduit, by E. Kuichling, Rochester Executive Board, 1898, pp. 34-35.
8 Gaugings of Old and New Hemlock Lake Conduits, Rochester Executive Board, 1899, pp. 35-36.
9 Summary of Gaugings of Hemlock Lake Conduits for years 1897-1901, Rochester Department of Public Works, 1901, pp. 171-4.
10 115 Hydraulic Experiments, Clemens Herschel, pp. 1 to 26.
11 Hydraulics of the Hemlock Lake Conduit of the Rochester Water Works, Geo. W. Rafter, C. E., Trans. Am. Soc. C. E., Vol. 26, pp. 13-22.
12 Measures for Restricting the Use and Waste of Water in Force in the City of Rochester, N. Y.; George W. Rafter, C. E., Trans. Am. Soc. C. E., Vol. 26, pp. 23-76.

Early in the fall of 1895 a measuring flume was constructed below the gates which controlled the outflow from the lake. The flume is 96 feet in length, forming a plank channel with bottom elevation of -1.00, side slopes of one and one-half to one, 26 feet bottom width. Eight feet upstream from the lower end of the channel, a submerged weir .98 foot high, with a crest 2 inches wide, is placed across the channel. Vertical stop planks or needles are provided by means of which the opening at the weir can be contracted to a width of 10 feet.[a] Bridges are placed across the stream above and below the measuring channel. The discharge is determined by means of rod floats timed by stop watch, the mean position or course of each float being also recorded. Painted round wooden rods, weighted nearly to submergence, of varying lengths adapted to the depth of the channel, are used. The floats are run through a course of 15 to 25 feet. The mean velocity of the water in each vertical plane is assumed to be the same as that of the float. From 100 to 200 or more float runs are included in each discharge measurement. From these a curve of mean velocity in a horizontal plane is obtained and the discharge calculated.[b]

The results of gaugings which have been made, (1) with the full width of the measuring flume, representing the natural outflow from the channel; and (2) with the contracted weir, are given in the accompanying tables. The method of gauging was devised by Emil Kuichling, C. E., and the discharge measurements have been made by John F. Skinner, C. E.

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[a] Preliminary Studies of the Yield of Hemlock Lake Watershed, Report of E. A. Fisher, C. E., Department of Public Works, of Rochester, 1900, pp. 39-141.

[b] See Paper by John F. Skinner, C. E., Methods of Gauging of Hemlock Lake Outlet; Trans. Cornell University Soc. of Civil Engineers of 1897-98, p. 144.

Mean Monthly Elevation of Surface of Hemlock Lake, N. Y. [a] [c]

YEAR.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Average for year.
1876	....	....	....	....	....	+1.283	+1.202	+0.557	+0.410	+0.900	+0.722	+0.422	[b] +0.785
1877	—0.055	—0.114	+0.934	+1.515	+1.275	+0.907	+0.651	+0.611	+0.053	—0.486	+0.048	+0.389	+0.473
1878	+0.788	+1.559	+1.778	+1.664	+1.255	+1.122	+0.918	+0.648	+0.228	—0.292	+0.111	+1.529	+0.942
1879	+1.004	+0.733	+1.219	+1.624	+1.028	+0.362	+0.097	—0.452	—1.096	—1.610	—1.867	—1.672	—0.052
1880	—0.910	—0.112	+0.212	+0.792	+0.865	+0.447	—0.147	—0.696	—1.130	—1.567	—1.238	—1.332	—0.401
1881	—1.467	—0.113	+1.198	+1.466	+1.323	+1.081	+0.579	0.100	—0.691	—0.811	—0.708	—0.051	+0.151
1882	+1.632	+1.392	+1.674	+1.512	+1.609	+1.452	+0.813	+0.150	—0.437	—0.985	—1.377	—1.518	+0.494
1883	—1.599	+0.031	+0.945	+1.569	+1.585	+1.375	+1.290	+0.643	+0.249	+0.072	+0.167	+0.442	+0.567
1884	+0.460	+1.281	+1.465	+1.561	+1.622	+1.014	+0.575	+0.273	—0.256	—0.695	—1.168	—1.392	+0.395
1885	—1.258	—1.364	—1.524	+0.882	+1.373	+1.121	+0.987	+0.291	—0.006	—0.295	—0.261	+0.410	+0.060
1886	+1.253	+1.318	+1.096	+1.592	+1.131	+0.554	+0.013	—0.422	—0.524	—1.282	—0.902	+0.376	+0.350
1887	+0.588	+1.673	+1.484	+1.421	+1.654	+1.089	+0.475	+0.056	—0.386	—0.631	—1.037	—1.097	+0.437
1888	—0.883	—0.712	+0.517	+1.965	+1.454	+1.357	+0.894	—0.181	—0.683	—0.956	—1.030	—0.555	+0.059
1889	+0.918	+1.250	+1.410	+1.493	+1.365	+1.945	+1.257	+0.669	+0.099	+0.267	+1.152	+1.289	+1.093
1890	+1.316	+1.197	+1.517	+1.620	+1.001	+1.755	+0.724	+0.236	+1.195	+1.123	+1.465	+1.176	+1.277
1891	+1.496	+2.031	+1.637	+1.516	+0.914	+0.542	+0.172	—0.135	—0.221	—0.620	—0.875	—0.402	+0.504
1892	+0.493	+0.821	+1.287	+1.658	+1.597	+1.527	+1.277	+0.668	+0.217	—0.195	—0.134	+0.433	+0.804
1893	+0.346	+0.789	+1.728	+2.049	+2.308	+1.382	+0.824	+0.277	+0.692	+0.433	+0.137	+0.384	+0.946
1894	+1.177	+1.301	+1.778	+1.854	+1.719	+1.695	+0.679	—0.070	—0.387	—0.570	—0.459	—1.788	+0.628
1895	—0.998	—0.860	+0.309	+1.580	+1.056	+0.333	—0.325	—0.856	—1.378	—2.172	—2.653	—2.790	—0.730

[a] Annual Report Executive Board, Rochester, N. Y., 1894-5, p. 222.
[b] Average for seven months.
[c] Referred to Rochester Water Works datum.

Mean Monthly Diversion from Hemlock Lake, N. Y. [a]

SECOND-FEET. [b]

MONTH.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.
January	11.30	12.71	15.97	17.11	16.36	17.68	18.21	19.40	20.90
February	10.15	14.96	16.42	17.51	16.46	19.74	19.70	20.47	21.70
March	10.40	15.07	15.38	16.88	16.24	18.47	19.20	20.06	21.15
April	10.79	12.69	15.78	16.81	16.40	18.26	18.31	19.80	20.90
May	10.09	14.35	15.72	17.94	16.82	17.52	18.92	20.07	20.78
June	10.73	16.18	15.54	16.85	18.09	18.83	20.53	21.13	20.77
July	11.10	18.52	16.88	16.21	19.33	18.72	20.02	21.91	20.30
August	10.51	16.17	16.48	16.10	18.34	20.72	20.01	21.36	21.50
September	11.52	15.98	15.00	15.79	18.09	18.23	19.43	20.65	22.90
October	12.12	15.69	14.96	16.24	16.72	17.90	18.80	20.06	20.30
November	11.66	14.98	16.12	16.60	16.94	18.00	18.23	20.54	20.46
December	11.86	15.31	15.71	16.20	17.03	18.42	19.29	20.34	21.86
Average per day.	11.07	15.22	15.88	16.70	17.24	18.96	19.22	20.48	21.10

Mean Annual Diversion from Hemlock Lake, N. Y. [c]

YEAR.	Gallons per 24 hours.	Second-feet.
1875	....	....
1876	....	....
1877	....	....
1878	....	....
1879	* 4,000,000	* 6.20
1880	4,341,100	6.73
1881	4,238,100	6.57
1882	4,528,900	7.02
1883	4,817,100	7.47
1884	5,348,800	8.29
1885	5,128,900	7.95
1886	5,773,700	8.94
1887	* 5,980,000	9.27
1888	* 6,185,000	9.59
1889	* 6,390,000	9.90
1890	* 6,595,000	10.23
1891	* 6,800,000	10.54
1892	* 7,000,000	10.85
1893	* 7,460,000	11.56
1894	7,469,800	11.58
1895	9,819,200	15.22
1896	10,241,900	15.88
1897	10,771,000	16.70
1898	11,122,500	17.24
1899	12,022,900	18.96
1900	12,398,222	19.20
1901	13,214,079	20.50
1902	13,640,405	21.10
1903	....	....

[a] Report Department of Public Works, Rochester, N. Y., 1901, p. 181.

[b] Includes losses due to leakage and evaporation in Rush and Mt. Hope Reservoirs.

[c] From Annual Report Rochester N. Y., Executive Board, 1899, p. 41, etc.

* Estimated.

NOTE.—The above figures for the consumption from the Hemlock Lake (gravity) system include the losses by evaporation and leakage from the reservoir.

Rod-float Measurements of Discharge of Outlet of Hemlock Lake, N. Y.[a][b]

DATE OF GAUGING.	Elevation of lake.	Mean cross-section of channel, square feet.	Discharge, second-feet.
1897.			
April 5	1.808	69.2	43.14
May 15	1.573	60.0	36.22
May 24	1.362	53.0	29.92
June 1	1.111	44.9	23.78
June 8	0.932	43.2	18.32
June 16	0.737	36.1	18.79
June 22	0.562	37.0	9.13
1898.			
April 2	1.816	83.9	42.44
April 8	1.686	79.5	33.41
April 12	1.581	76.4	31.67
April 16	1.494	73.7	25.81
April 26	1.869	85.6	44.26
May 2	1.739	81.5	39.39
May 14	1.622	78.1	35.36
May 18	1.535	74.8	30.17
June 2	1.401	70.4	23.85
June 6	1.273	66.4	19.50
June 10	1.157	62.2	15.61
June 16	1.054	58.9	18.29
July 6	0.753	49.5	6.85
July 11	0.566	43.9	4.02
July 14	0.480	41.1	3.16
1899.			
January 21	1.663	60.8	43.63
April 19	1.669	79.1	38.66
April 26	1.502	74.1	30.80
May 11	1.284	66.5	22.48
May 25	0.994	57.0	16.91
1900.			
April 6	2.248	97.5	67.75
April 11	2.261	98.2	74.67
May 2	1.772	81.8	41.19
1901.			
April 2	2.420	104.0	80.63
May 1	2.344	102.7	77.97
May 8	2.092	93.9	60.16
May 14	2.281	100.5	72.37
May 21	1.979	90.1	50.31

Rod-float Measurements of Discharge of Outlet of Hemlock Lake, N. Y.[c][d]

DATE OF GAUGING.	Elevation of lake.	Mean cross-section of channel, square feet.	Discharge, second-feet.
1897			
April 17	1.868	76.7	61.83
April 24	1.618	66.2	44.28
May 20	1.422	59.3	38.79
June 3	1.080	46.2	25.74
June 8	0.932	44.7	21.19
June 16	0.737	36.6	15.84
June 22	0.562	35.3	10.33
1898.			
March 26	1.494	75.4	36.59
April 2	1.816	83.9	59.27
April 8	1.686	79.1	44.51

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[a] Submerged weir, 10 feet long.
[b] Report Rochester, N. Y., Department Public Works, 1901, p. 175.
[c] Report Rochester, N. Y., Department of Public Works, 1901, p. 174.
[d] Submerged weir, full width of channel.

Rod-float Measurements of Discharge of Outlet of Hemlock Lake, N. Y. a b—(Concluded)

DATE OF GAUGING.	Elevation of lake.	Mean cross-section of channel, square feet.	Discharge, second-feet.
1898.			
April 12	1.581	76.3	37.48
April 16	1.494	73.4	30.08
April 26	1.869	85.6	63.39
May 2	1.739	84.5	54.89
May 14	1.622	78.0	43.47
May 18	1.585	75.0	35.78
June 2	1.401	70.4	26.67
June 6	1.273	66.7	22.79
June 10	1.157	63.1	17.72
June 16	1.054	59.0	12.79
June 27	1.005	57.7	12.57
July 6	0.753	50.1	7.27
July 11	0.566	44.5	4.32
July 14	0.480	41.2	3.72
1899.			
January 21	1.663	59.3	53.63
April 19	1.669	79.1	45.68
April 26	1.502	73.4	36.22
May 11	1.284	66.1	26.99
May 25	.994	57.1	18.59
1900.			
April 5	2.143	92.8	90.10
April 11	2.266	96.9	118.13
May 2	1.769	81.6	53.25
May 19	1.578	74.7	32.69
1901.			
March 29	2.960	117.1	250.68
April 2	2.420	102.0	141.09
April 11	2.879	116.1	240.98
April 16	2.610	108.2	181.87
April 23	3.243	126.3	341.76
April 25	3.057	120.9	287.98
May 1	2.366	100.8	126.46
May 8	2.086	92.8	84.00
May 14	2.236	97.6	89.44
May 21	1.980	89.5	67.02

OAK ORCHARD CREEK AND TONAWANDA FEEDER GAUGING STATIONS NEAR MEDINA, ORLEANS COUNTY, N. Y.

Oak Orchard Creek drains a swampy plateau having an elevation of 600 to 650 feet, lying in an easterly and westerly direction, south of Medina and Albion, N. Y.

At the western border of this swamp, the stream turns northerly, crosses Erie Canal at Medina, and enters Lake Ontario at Point Breeze. The creek and its watershed are shown on the Albion, Medina, Ridgeway and Oak Orchard sheets of the Topographic map of the U. S. Geological Survey. The original Tonawanda Swamp had three outlets, the eastern end draining into

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a Report Rochester, N. Y., Department of Public Works, 1901, p. 174.
b Submerged weir, full width of channel.

Sandy Creek near Holly, N. Y., and the western end being tributary to Tonawanda Creek.

In 1824, a channel was cut from Tonawanda Creek across the western end of the Tonawanda Swamp entering Oak Orchard Creek, the object being to divert a portion of the flow of Tonawanda Creek to feed the long level of Erie Canal extending from Lockport to Rochester. This feeder channel intercepts the drainage from a portion of Tonawanda Creek watershed including Whitney Creek, a small tributary. The flow from the diverting dam on Tonawanda Creek into the feeder channel is controlled by gates and is cut off, except during the season of canal navigation.

The upland watershed of Oak Orchard Creek is slightly rolling, has a compact clay soil, is nearly devoid of timber land and is under a high state of cultivation. The swamp itself has a clay or gravel hard pan overlaid with a few feet of peaty black muck. The swamp is practically covered with a growth of hardwood swamp timber. The upland is underlaid by soft argillaceous shales at no great depth, in the region south of Medina. A barrier of hard limestone crosses the stream below the swamp outlet in the vicinity of Shelby. At Shelby, the stream makes a descent of approximately 80 feet over ledge of the limestone barrier, encountering lower down in its course the Medina sandstone, and making a further descent of approximately 100 feet at Medina.[a]

Tonawanda Swamp affords a large surface storage area, but owing to the restricted outlet of the stream, the floods are severe. The low-water flow is sustained by the gradual lowering of the ground water in the swamp area and to some extent by the contribution of springs from the pervious strata of Helderberg limestone forming the southerly divide of the watershed.

The diverting channel from Tonawanda Creek has a total length of 107,712 feet in which occurs a fall of 30.1 feet. It was the original intention in 1823 to utilize this channel to draw off a portion of the flood waters of Tonawanda Creek, thereby aiding to regulate the lower navigable portion of Tonawanda Creek. The diverting channel was designed to have a bottom width of 70 feet, but has never been constructed to this capacity. The right of way for the diverting channel is said to have been provided by the Holland Land Company which was largely benefited by the reclamation of extensive swamp area bordering the diverting channel, and by the creation of valuable water power privileges which have since been developed in the vicinity of Medina. The feeder channel is used at the present time as the outlet of numerous farm drains from the adjoining flats.

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[a] The watershed is described in Report of James T. Gardiner on Drainage of the Oak Orchard Swamp, Fourth An. Report N. Y. State Board of Health, 1883, pp. 43-116.

Water brought from lower Tonawanda Creek and from Lake Erie through the Erie Canal is passed over the waste weir at Medina, entering Oak Orchard Creek. The amount thus inverted to the watershed at times greatly exceeds that taken from Oak Orchard Creek Feeder for the supply of the canal; hence, the importance of the stream for water power purposes is chiefly confined to its lower course of about eighteen miles from Medina to its mouth. In this distance occurs a fall of 250 feet. The stream flows throughout much of the distance through a gulf cut in the drift overlying the Medina sandstone and affording a narrow flood plain.

A temporary gauging station was established on Oak Orchard Creek at Coon's Bridge for the Department of the Attorney-General of New York, May 16, 1903.

Coon's Bridge is located six miles from Medina along stream, and is just below the junction of Tonawanda Feeder, and the so-called Acker Ditch, an artificial channel two miles in length leading Oak Orchard Creek into the lower end of the feeder channel. The bridge has a single span of 60.8 feet between vertical masonry abutments. The low-water flow is confined in a central channel about 25 feet in width with hard gravel bed and smooth uniform current, this channel having been excavated by New York State in 1894. A low-water gauge, reading from zero to 4.5 feet, is attached vertically to a brace post underneath the downstream side of the bridge and at the right-hand side of the low-water channel.

Tonawanda Creek: Indian Falls, Genesee County, N. Y., 34 miles by stream, or 16 miles air line, above junction of creek with Erie Canal at Pendleton, Niagara County, N. Y.

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The stream bends about 100 feet above the bridge but is straight below, and the current passes underneath normal to the bridge. The remaining channel, unoccupied by the low-water course, is covered with silt and sand, with numerous willow bushes.

A secondary flood channel, having a width of 26 feet between abutments, is situated 283 feet to the right of the main bridge. Water also flows over a highway between the two bridges in extreme freshets.

The bench mark at Coon's Bridge is a square bolt head in the center of the capstone at upstream side, left-hand abutment forming bridge seat. Elevation referred to State datum 613.32. Elevation zero mark, low-water gauge, 603.22.

The high water of 1894 reached elevation 612.5 on State datum. This was previous to the improvement. Water surface March 4, 1903, was at elevation 610.98, corresponding to gauge reading 7.76.

During low water no flow passes from the head of the Acker Ditch through the natural channel of Oak Orchard Creek; the flow at Coon's Bridge being made up of the discharge of Oak Orchard Creek proper, the inversion from Tonawanda Creek to the feeder, the inflow from Whitney Creek and the portion of Tonawanda Swamp intercepted by the feeder, the drainage from the swamp, and the inflow from farm drains to the feeder within Oak Orchard Watershed.

Measurements of the slight inflow from Whitney Creek and other sources were made May 16 to 21, by means of floats in a straight, uniform section of the feeder 50 feet in length, having its head 750 feet upstream from the gauge. The gauge reader at Coon's Bridge is Rolla' Dunlap.

The accompanying table shows a summary of gaugings made to show the relative discharge of Oak Orchard Creek proper and of Oak Orchard Creek combined with the flow in the channel of the feeder itself and of Whitney Creek. The flow in Oak Orchard Creek was obtained at the Acker farm bridge about 800 feet upstream from Coon's Bridge.

In determining the discharge in the feeder at Lewiston Road, water-soaked floats were used which would remain just submerged and were timed in groups of two or three each at intervals of 2 feet across the stream. Soundings at intervals of 1 foot were taken in those sections 10 feet apart. There was no wind during the progress of the measurements, and no slackwater at the sides of the measuring section. The bed of the channel is of soft clay silt.

The discharge of Whitney Creek was determined by current meter checked by means of floats in a narrow deep section having hard clay bed, situated about 1,000 feet above the mouth of the stream.

Oak Orchard Creek and Feeder Discharge.

DATE.	Flow in feeder, C. F. S.	DISCHARGE OF WHITNEY CREEK.[a]		Outflow from swamp, C. F. S.
		C. F. S.	Second-feet per square mile.	
1903.				
May 16	1.52	.90	.117	30.6
May 17	1.22	.78	.101	28.4
May 18	1.85	1.09	.142	30.0
July 21	19.68	....	....	....

Drainage Areas Oak Orchard Creek. [b]

LOCATION.	Place to place, square miles.	Total area, square miles.
Above Coon's Bridge	142.6	142.6
Above Medina feeder dam	8.1	150.7
Above Ridgeway	7.5	158.2
Above mouth	23.7	281.9
Swamp area	....	32.0
Swamp area per cent., above Coon's Bridge	....	22.44
Tonawanda Creek, above diverting dam	....	[c] 236.30

MISCELLANEOUS MEASUREMENTS.

Oak Orchard Creek, Ridgeway Bridge below Erie Canal, May 18, 1903; by R. E. Horton and C. C. Covert. Water surface, 9.15 feet below coping downstream right-hand abutment. Discharge, 159.7 C. F. S. or 1.009 second-feet per square mile from 158.2 square miles. 0.41 inches rainfall during 30 days preceding.

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[a] Drainage areas 7.67 square miles.
[b] From U. S. G. S. Topographic map.
[c] From Bien's Atlas of New York.

Tonawanda Creek, Indian Bridge above feeder, May 17, 1903; by R. E. Horton and C. C. Covert. Water surface, 15.55 feet below top downstream right-hand abutment. Discharge, 47.0 second-feet or .205 second-feet per square mile from 228.8 square miles. 0.41 inches rain during 30 days preceding.

Current-meter Discharge Measurements of Oak Orchard Creek, at Coon's Bridge, near Medina, N. Y.

DATE.	Hydrographer.	Gauge height (feet).	Discharge (second-feet).
1903			
May 16	R. E. Horton	*a*1.40	33.0
May 17	R. E. Horton	1.33	31.5
May 18	R. E. Horton	1.30	30.4
June 14	H. H. Halsey	0.95	17.2
June 14	H. H. Halsey	0.95	17.3
July 22	C. C. Covert	1.225	19.2
July 24	C. C. Covert	1.20	19.1
July 24	C. C. Covert	1.20	19.5

Mean Daily Gauge Height, Feet, of Oak Orchard Creek at Coon's Bridge, near Medina, N. Y.

DAY	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	1.15	1.50	1.12	2.00	1.30	1.30	1.25
2	......	......	......	......	......	1.08	1.38	1.10	1.85	1.30	1.25	1.30
3	......	......	......	......	......	1.02	1.38	1.10	1.72	1.30	1.22	1.25
4	......	......	......	......	......	*b*1.00	1.35	2.30	1.68	1.20	1.25	1.30
5	......	......	......	......	......	1.00	1.35	2.82	1.75	1.12	1.30	1.30
6	......	......	......	......	......	0.95	1.45	2.30	1.60	1.30	1.25	1.35
7	......	......	......	......	......	0.85	1.40	2.15	1.70	1.38	1.30	1.42
8	......	......	......	......	......	1.00	1.37	2.05	1.70	1.48	1.48	1.48
9	......	......	......	......	......	1.00	1.30	2.10	1.70	1.50	1.50	1.42
10	......	......	......	......	......	1.00	1.30	2.40	1.85	1.50	1.45	1.50
11	......	......	......	......	......	1.00	1.30	2.22	1.80	1.50	1.42	1.50
12	......	......	......	......	......	1.00	1.20	2.05	1.75	1.50	1.48	1.50
13	......	......	......	......	......	0.90	1.10	1.85	1.70	1.50	1.48	1.65
14	......	......	......	......	......	1.00	1.10	1.72	1.68	1.50	1.48	1.50
15	......	......	......	......	......	1.00	1.18	1.48	1.62	1.50	1.48	1.48
16	......	......	......	......	......	1.00	1.18	1.35	1.60	1.50	1.50	1.50
17	......	......	......	......	1.30	1.00	1.18	1.28	1.60	1.45	1.52	1.60
18	......	......	......	......	1.30	1.00	1.18	1.18	1.60	1.50	1.70	1.65
19	......	......	......	......	1.25	1.00	1.20	1.10	1.60	1.50	1.60	1.62
20	......	......	......	......	1.20	1.00	1.20	0.50	1.55	1.48	1.72	1.70
21	......	......	......	......	1.50	1.00	1.15	0.80	1.40	1.45	1.45	1.72
22	......	......	......	......	1.48	1.00	1.22	0.75	1.40	1.40	1.40	1.78
23	......	......	......	......	1.40	1.00	1.22	1.00	1.40	1.40	1.38	1.78
24	......	......	......	......	1.40	1.00	1.22	0.95	1.38	1.38	1.40	2.00
25	......	......	......	......	1.30	1.00	1.18	1.08	1.40	1.35	1.35	2.00
26	......	......	......	......	1.30	1.00	1.12	1.05	1.22	1.32	1.40	2.05
27	......	......	......	......	1.30	1.00	1.10	1.00	1.30	1.32	1.32	2.10
28	......	......	......	......	1.32	1.00	1.08	1.05	1.25	1.32	1.30	2.02
29	......	......	......	......	1.30	1.00	1.08	1.10	1.28	1.30	1.30	2.00
30	......	......	......	......	1.25	1.05	1.75	1.62	1.30	1.30	1.30	1.90
31	......	......	......	......	1.20	......	1.40	1.95	......	1.30	......	1.90

a Referred to new gauge. Original gauge one foot higher.
b Approximate June 4-30, 1903.

IRONDEQUOIT RIVER AT PENFIELD, MONROE COUNTY, N. Y.

A gauging record was maintained under the direction of John F. Skinner, C. E., during a portion of the months of April, May and July, 1896. The record included the depth flowing over a dam having a crest 92 feet in length with a somewhat irregular profile and which was divided into seven sections of equal length for purposes of computation; the average elevation of each section having been determined by levels. The dam rests upon rock, has a sloping upstream face and vertical downstream face. The discharge was calculated by means of the Francis formula, no correction being necessary for velocity of approach or for leakage. The record also included water drawn for driving the turbines for two mills below the dam.

The drainage basin of this stream is shown on the Rochester, Macedon, Honeoye and Canandaigua sheets of the U. S. Geological Survey Topographic map.

Irondequoit River is formed by the junction of Irondequoit and Thomas Creeks, flows northerly into Irondequoit Bay, an arm of Lake Ontario. At the head of the gulf enclosing the bay the stream makes a descent of 80 feet in about one mile. It is in this stretch of the river that the Penfield dam is located.

Irondequoit Creek drains a group of serrated hills rising 300 feet above the general plateau and situated in a region of Salina shale.

Thomas Creek receives the greater portion of its drainage from a region underlaid by the Niagara formation, moderately rolling, with some marsh areas, relatively impervious soil, and some artificial channels. The summer flow is complicated by discharge from three waste weirs located in the level of the Erie Canal, which crosses the drainage basin.

The precipitation recorded at Rochester during the continuation of the gauging record was as follows:

MONTH.	Depth in inches.
1896.	
April 1 to 18, inclusive	.21
April 18 to 30, inclusive	.38
May 1 to 25, inclusive	.45
May 26 to 31, inclusive	1.19
June	2.30
July	4.75

The precipitation was quite uniformly distributed throughout the periods indicated.

Mean Daily Discharge in Second-feet of Irondequoit River, at Penfield, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1896												
1	......	......	......	......	37.8	......	28.9	......	......	......	......	......
2	......	......	......	......	53.1	......	37.8	......	......	......	......	......
3	......	......	......	......	......	......	42.7	......	......	......	......	......
4	......	......	......	......	42.7	......	......	......	......	......	......	......
5	......	......	......	......	45.3	......	......	......	......	......	......	......
6	......	......	......	......	40.2	......	42.7	......	......	......	......	......
7	......	......	......	......	33.3	......	40.2	......	......	......	......	......
8	......	......	......	......	......	......	37.8	......	......	......	......	......
9	......	......	......	......	......	......	37.8	......	......	......	......	......
10	......	......	......	......	......	......	31.1	......	......	......	......	......
11	......	......	......	......	......	......	35.6	......	......	......	......	......
12	......	......	......	......	37.8	......	......	......	......	......	......	......
13	......	......	......	......	40.2	......	37.8	......	......	......	......	......
14	......	......	......	......	40.2	......	33.3	......	......	......	......	......
15	......	......	......	......	42.7	......	31.1	......	......	......	......	......
16	......	......	......	......	40.2	......	28.9	......	......	......	......	......
17	......	......	......	......	......	......	24.8	......	......	......	......	......
18	......	......	......	......	37.8	......	26.8	......	......	......	......	......
19	......	......	......	64.5	37.8	......	......	......	......	......	......	......
20	......	......	......	67.5	......	......	37.8	......	......	......	......	......
21	......	......	......	50.4	31.1	......	67.5	......	......	......	......	......
22	......	......	......	73.9	35.6	......	40.2	......	......	......	......	......
23	......	......	......	61.6	35.6	......	33.3	......	......	......	......	......
24	......	......	......	58.7	......	......	40.2	......	......	......	......	......
25	......	......	......	47.8	35.6	......	37.8	......	......	......	......	......
26	......	......	......	......	35.6	......	......	......	......	......	......	......
27	......	......	......	61.6	28.9	......	45.3	......	......	......	......	......
28	......	......	......	42.7	31.1	......	37.8	......	......	......	......	......
29	......	......	......	42.7	......	......	40.2	......	......	......	......	......
30	......	......	......	47.8	......	......	37.8	......	......	......	......	......
31	......	......	......	......	......	......	50.4	......	......	......	......	......

ST. LAWRENCE RIVER DRAINAGE.[a]

[a] Records at the following points have been omitted from this report:
Indian River at Natural Bridge, N. Y.
Raquette River at Hannawa Falls, N. Y.
Description of the latter will be found in the 1902 Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor of N. Y. for 1902.

OSWEGATCHIE RIVER AT EEL WEIR BRIDGE NEAR OGDENSBURG, ST. LAWRENCE COUNTY, N. Y.

A gauging station was established at this bridge May 16, 1903. Observations of the stream stage are taken morning and night by Joseph H. LaRue.

This stream has its source in a region of lakes and timbered swamps in southern St. Lawrence county. The largest of the lakes is Cranberry Lake, which affords valuable storage to water power users on its outlet, East Branch Oswegatchie River. The east and west branches flow in a general direction northwesterly. The two branches join near Talcville. From Gouverneur to Oxbow the river flows southwest. It then turns abruptly to the northeast. At Galilee it is joined by the outlet of Black Lake, and finally enters St. Lawrence River at Ogdensburg.

The Eel Weir Bridge is located just below the junction of Oswegatchie River and Black Lake Outlet. The channel is in rock and is partly artificial; rock underneath the bridge having been removed by blasting to increase the bridge opening.

A weight and chain gauge is attached to the iron work of the bridge on the upstream side of the right-hand span. The bench mark is a square chisel draft on the upstream side of the right-hand abutment.

Elevation assumed	100.00
Elevation of datum plane of gauge	83.28

The bridge consists of two spans of, right-hand, 129.6; left-hand, 130.1, feet length, respectively.

Drainage Areas of Oswegatchie River. [a]

LOCATION.	Square miles.
East branch Oswegatchie River above mouth	858
West branch Oswegatchie River above mouth	272
Oswegatchie River below junction of two branches	630
Oswegatchie River above Gouverneur	727
Oswegatchie River above Galilee	1,033
Indian River above Philadelphia	216
Black Lake Watershed above Galilee	544
Oswegatchie River below Black Lake Junction	1,577
Oswegatchie River above Ogdensburg	1,609
Black Lake water surface	17.2
Cranberry Lake water surface	12.8

[a] From Blen's Atlas of N. Y. State.

Current-meter Discharge Measurements of Oswegatchie River at Eel Weir Bridge, Near Ogdensburg, N. Y.

DATE.	Hydrographer.	Gauge height (feet).	Discharge (second-feet.)
1900			
September 25	R. E. Horton		614
1903			
May 5	C. C. Covert	4.70	1,044
May 14	H. H. Halsey	4.60	830
May 14	H. H. Halsey	4.60	729
September 22	C. C. Covert	4.70	812

Mean Daily Gauge Height, Feet, of Oswegatchie River at Eel Weir Bridge, Near Ogdensburg, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903												
1	......	......	......	......	5.15	4.40	5.30	5.55	4.80	4.50	5.60	5.10
2	......	......	......	......	5.10	4.40	5.30	5.80	4.80	4.50	5.45	5.00
3	......	......	......	......	5.05	4.45	5.10	5.80	4.80	4.50	5.35	5.00
4	......	......	......	......	4.95	4.40	5.10	5.80	4.80	4.60	5.25	4.90
5	......	......	......	......	4.70	4.40	5.15	5.80	4.80	4.55	5.20	4.80
6	......	......	......	......	4.70	4.40	5.10	5.80	4.80	4.50	5.00	4.70
7	......	......	......	......	4.70	4.40	5.05	5.80	4.75	4.60	5.15	4.70
8	......	......	......	......	4.70	4.40	5.10	5.80	4.70	4.60	5.40	4.70
9	......	......	......	......	4.70	4.40	5.05	5.80	4.70	4.60	5.50	4.70
10	......	......	......	......	4.85	4.50	5.00	5.80	4.70	4.80	5.40	4.70
11	......	......	......	......	4.80	4.40	5.00	5.80	4.70	5.25	5.40	4.70
12	......	......	......	......	4.80	4.40	4.95	5.80	4.60	5.75	5.35	4.70
13	......	......	......	......	4.80	4.50	5.00	5.80	4.60	6.50	5.30	4.70
14	......	......	......	......	4.60	4.65	4.85	5.70	4.60	6.65	5.20	4.70
15	......	......	......	......	4.65	4.85	4.75	5.80	4.60	6.70	5.15	4.75
16	......	......	......	......	4.70	5.00	4.70	5.50	4.60	6.70	4.80	4.70
17	......	......	......	......	4.70	5.40	4.70	5.45	4.70	6.65	5.20	4.70
18	......	......	......	......	4.65	5.40	4.65	5.40	4.75	6.50	5.20	4.70
19	......	......	......	......	4.65	5.35	4.60	5.30	4.70	6.50	5.20	4.70
20	......	......	......	......	4.70	5.20	4.50	5.25	4.70	6.55	5.20	4.70
21	......	......	......	......	4.65	5.00	4.60	5.05	4.70	6.50	5.15	4.70
22	......	......	......	6.20	4.50	5.05	4.60	5.15	4.70	6.50	5.20	4.70
23	......	......	......	6.05	4.50	5.10	4.65	4.80	4.70	6.50	5.20	4.70
24	......	......	......	5.85	4.45	5.30	4.80	4.80	4.70	6.45	5.20	4.70
25	......	......	......	5.70	4.50	5.40	4.85	4.80	4.70	6.40	5.10	4.80
26	......	......	......	5.60	4.55	5.50	4.80	4.80	4.65	6.25	5.10	5.05
27	......	......	......	5.60	4.60	5.50	4.90	4.80	4.60	6.05	5.10	5.20
28	......	......	......	5.55	4.80	5.45	4.95	4.75	4.60	5.80	5.10	5.10
29	......	......	......	5.35	4.55	5.30	5.20	4.80	4.50	5.75	5.10	5.05
30	......	......	......	5.30	4.40	5.30	5.25	4.80	4.50	5.65	5.10	5.10
31	......	......	......	......	4.40	......	5.30	4.80	......	5.60	......	5.10

RAQUETTE RIVER AT MASSENA SPRINGS, ST. LAWRENCE COUNTY, N. Y.

Observations at the dam of the Hannawa Falls Power Company on Raquette River were taken from September 31, 1902, to March 31, 1903. The discharge has not been calculated. A gauging station was established at Massena Springs Highway Bridge on Raquette River September 21, 1903. Observations were continued until October 17, 1903, and will be again taken up when a suitable observer can be found. The gauge is a vertical scale divided decimally, attached to the right-hand abutment on the upstream side of the bridge. The bench mark is an X painted on outside downstream corner of foundation to adjacent sulphur springs.

Assumed elevation	100.00
Elevation zero of gauge	87.786

The bridge has a single span of 167.5 feet. Current is swift and uniform. Banks are not overflowed. Stream channel is straight for 300 feet above and 1,000 feet below bridge.[a]

Raquette River drains a long, narrow watershed extending from Hamilton county to St. Lawrence River. Above Piercefield the drainage basin broadens out, including a region interspersed with lakes and ponds and affording ample opportunities for storage development,[b] as shown by the following list of lakes.

LAKE.	Elevation water surface.	Surface area square miles.	Drainage area square miles.
Blue Mountain Lake[c]	1,788	3.9	39.26
Raquette Lake	1.762	8.3	93.9
Forked Lake	1,741	2.5	39.8
Long Lake	1,629	4.7	152.2
Big Tupper Lake	1,554	8.0	59.3

The headwaters of Raquette River are on an elevated plateau dotted with mountains and interspersed with lakes. The region is timbered and underlaid with granitic gneiss of the Adirondack formation; the soil in the valleys being often sandy. Numerous marsh and swamp areas exist; many of these are on the watershed divide and feed streams flowing in opposite directions.[d]

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[a] For additional data, see Report on Steam Gaugings contained in Supplement of Report of State Engineer and Surveyor for 1902, pp. 105–107.

[b] Described in Report on A Survey of Upper Hudson and Raquette Rivers, Farrand N. Benedict, 1872.

[c] Including Eagle and Utowana Lakes.

[d] The upper drainage basin is shown on the Blue Mountain, Raquette Lake, Big Moose and Canada Lake quadrangles of the U. S. G. S. Topographic map. Drainage areas south of the 75th meridian have been taken from this map. Those to the north are from Bien's Atlas of New York.

Drainage Areas of Raquette River.

LOCATION.	Area, point to point.	Total square miles.
Blue Mountain and Utowana Lakes	....	18.4
South inlet, above mouth	....	32.7
Above Raquette Lake Outlet	67.0	118.1
Above Forked Lake Dam	55.2	173.3
Above outlet Long Lake	100.5	273.8
Above Raquette Pond Dam	421.1	694.9
Above Hannawa Falls	257.9	952.7
Above Massena Springs	216.0	1,168.7
Above mouth	50.0	1,218.7

LAKE CHAMPLAIN DRAINAGE.[a]

LAKE CHAMPLAIN OUTLET AT FORT MONTGOMERY, CLINTON COUNTY, N. Y.

Lake Champlain drains an area of 7,750 square miles, of which a large portion lies in the State of New York. The center line of the lake forms the boundary between New York and Vermont. The foot of the lake is situated at Rouses Point, near the Canadian boundary line. Richelieu River, the outlet of the lake, is 75 miles in length. It flows northerly across the Province of Quebec and enters St. Lawrence River at Sorel. The lake has a water surface area of 437 square miles. It receives the drainage from the northeast slope of the Adirondacks. The principal tributary streams in New York are Chazy, Saranac, Ausable, and Bouquet Rivers and Lake George Outlet. From Vermont it receives the discharge of Otter Creek, Winooski, Missiquoi and numerous smaller rivers. A record of the height of lake surface at Rouses Point has been kept by the U. S. Corps of Engineers, at Fort Montgomery, beginning 1875.[a]

Through the courtesy of Capt. Harry Taylor, the gauge readings taken by William McComb, fort keeper, at 9 a. m. each day are reported weekly to the U. S. Geological Survey.

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[a] A reconnaissance of the Lake Champlain Drainage Basin in New York was begun in March, 1903, by A. M. Evans, C. E. Portions of the area not then covered were visited by the writer in September, 1903, and low-water measurements made.

[a] For record of preceding years, see Report on Stream Gaugings, contained in Supplement of Report of State Engineer and Surveyor of New York for 1902, pp. 107-113.

The daily discharge from the lake has been determined from observations of the depth and discharge over the Chambly Dam, 35 miles below the head of Richelieu River, made in 1898 by the U. S. Deep Waterways Survey. The following miscellaneous measurements of this stream at St. Johns, P. Q., have also been made:[a]

October 16, 1862, by Mr. Charles Legge;[b] measurement near St. Johns:	
Discharge in cubic feet per second	4,257
September 10, 1894, by Mr. Henry Holgate;[c] measurement near St. Johns:	
Reading of gauge at St. Johns	7.58
Surface of water at St. Johns above tide	93.85
Discharge in cubic feet per second	6,390
August 22, 1895, by Mr. Cecil B. Smith;[c] measurement near St. Johns:	
Reading of gauge at St. Johns	7.67
Surface of water at St. Johns above tide	93.94
Discharge in cubic feet per second	6,102
October 17, 1895, by Prof. C. H. McLeod;[c] measurement near St. Johns:	
Reading of gauge at St. Johns	7.00
Surface of water at St. Johns above tide	93.27
Discharge in cubic feet per second	3,750
April 28, 1899, by J. W. Macklin; weir measurement at dam of Chambly Power Company, Chambly, Quebec:	
Length of weir, feet	1,625
Depth of water on weir measured to surface of still water above, feet	3.20
Reading of gauge at St. Johns	11.75
Surface of water at St. Johns above tide	99.13

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[a] Report of U. S. Board of Engineers on Deep Waterways, Part 1, page 431.

[b] Furnished by Ernest Marceau, Esq., engineer of railways and canals, Montreal, Canada.

[c] Furnished by Mr. J. W. Macklin, engineer of the Chambly Power Company.

Au Sable River, Au Sable Chasm, Clinton County, N. Y.

Discharge in cubic feet per second, as computed by Mr. Macklin (passing over weir)	29,050
Add passing through sluice to mill	800
Total	29,850

At the time the above gauging was made there was no wind and the river had been at about the same stage for several days. This is probably near a high-water discharge.

The gaugings of Messrs. Holgate and Smith were made with tubes weighted so as to float vertically and reaching nearly to the bottom with but little projecting above the water. That by Professor McLeod was made with an "Amsler mechanical meter."

The following table enables the Richelieu River record heretofore published to be extended somewhat. The table shows the highest and lowest depth of water on the upper mitre sill of lock No. 1 of the Chambly Canal at St. Johns, P. Q., for the years 1863 to 1870 inclusive.[a]

The data have been obtained and connected with the Fort Montgomery datum through R. Steckel, C. E., Geodetic Engineer for Canada. The record covers a period prior to the construction of the Chambly Dam, and includes the highest recorded stage of the stream. The elevation of the upper mitre sill is 87.41 feet above New York mean tide.

	Feet.
Maximum observed stage at St. Johns April, 1869, 13.87= elevation	101.28
Fall from Fort Montgomery to St. Johns, 22 miles	2.00
Estimated elevation Lake Champlain	103.28
Equivalent gauge reading and maximum fluctuation Lake Champlain	9.78

The slope of the stream decreased as the water lowered and is stated to have been thirty-eight hundredths of a foot (0.38′) in 22 miles when the elevation at St. Johns was at its minimum elevation of 93.29 (date not given) corresponding to elevation 93.67 in Lake Champlain.

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[a] Report of U. S. Deep Waterways Commission 1896, page 139.

Maximum and Minimum Monthly Stage of Richelieu River, above Upper Miter Sill of Lock No. 1, St. Johns, P. Q.[a]

MONTH.	1863.		1864.		1865.		1866.		1867.		1868.		1869.		1870.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
January	......	......	......	......	......	......	......	......	......	......	......	......	9.33	8.67	10.25	9.42
February	......	......	......	......	......	......	......	......	......	......	......	......	9.00	8.83	10.33	9.58
March	......	......	......	......	......	......	......	......	......	......	......	......	9.25	8.75	10.00	9.17
April	......	......	......	......	......	11.67	......	10.50	......	......	10.25	9.58	13.87	9.83	12.67	10.17
May	......	......	11.33	10.67	11.50	10.67	10.50	9.67	12.75	11.50	10.79	9.00	13.83	12.25	12.33	10.17
June	......	......	10.92	8.58	10.67	9.25	10.00	9.17	12.33	10.50	10.92	9.25	12.17	10.17	10.25	8.75
July	......	......	8.75	7.83	9.33	8.67	9.25	8.42	......	......	9.33	8.25	10.25	9.08	9.08	8.17
August	......	......	7.92	7.42	8.92	7.83	8.67	8.08	......	......	8.58	7.58	9.83	8.83	8.25	7.83
September	......	......	8.00	7.17	8.00	7.25	9.75	8.25	......	......	8.25	7.08	8.58	8.25	8.08	7.17
October	9.83	8.42	8.67	7.83	8.25	6.75	9.42	9.00	......	......	9.67	7.17	11.42	8.17	9.50	7.00
November	9.83	8.42	9.75	8.58	7.25	6.50	9.83	8.83	......	......	9.75	7.33	11.08	9.83	9.00	7.50
December	......	......	10.00	9.75	......	......	......	9.92	......	......	9.42	8.75	10.25	9.17	8.08	7.75

[a] Elevation of upper miter sill 87.41 above mean tide at New York.

Mean Daily Discharge, Second-feet, of Lake Champlain, at Fort Montgomery, N. Y.[a]

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	11,290	12,520	15,310	40,240	22,900	12,520	11,800	10,100	9,250	6,700	6,700	6,530
2	11,120	12,520	17,120	43,940	23,380	11,980	11,980	10,440	9,420	6,020	6,870	6,020
3	11,290	12,700	17,610	41,720	26,700	11,460	11,800	13,980	9,420	6,190	6,700	6,020
4	11,120	13,240	18,030	40,610	21,940	11,460	11,630	10,780	9,080	7,890	6,700	6,020
5	11,120	13,240	18,240	40,240	21,480	11,290	11,630	10,780	8,910	6,870	6,020	6,190
6	11,290	13,420	18,450	40,610	20,820	11,290	11,460	11,630	8,740	6,020	6,360	6,020
7	11,290	13,420	19,500	41,350	20,380	11,460	11,460	9,930	8,570	6,870	6,700	6,020
8	11,460	13,600	18,660	39,500	20,160	11,460	11,290	10,270	8,570	7,380	6,700	5,850
9	11,290	13,600	19,940	39,500	19,500	10,780	11,120	10,610	9,080	6,530	7,210	5,850
10	11,290	13,790	20,820	38,800	19,080	10,780	11,120	9,760	9,930	6,700	7,550	5,850
11	11,290	13,790	23,140	38,450	19,080	10,440	11,120	10,270	8,060	6,530	6,870	6,020
12	11,120	13,790	25,140	37,400	18,660	10,780	11,120	9,930	8,400	6,360	6,700	6,190
13	11,120	13,980	26,700	36,700	18,660	11,120	10,950	9,760	8,910	6,360	7,350	6,020
14	11,120	14,550	28,440	36,000	18,030	11,630	10,610	10,100	8,230	6,190	6,870	6,190
15	11,290	14,740	29,020	36,000	17,400	11,630	11,460	9,760	7,890	6,530	6,530	6,190
16	11,120	14,740	29,910	33,690	17,120	11,460	10,270	9,760	8,400	7,210	6,360	6,190
17	11,120	14,930	30,220	32,700	16,830	11,800	10,440	9,760	8,400	6,700	7,210	6,020
18	11,120	14,930	30,840	31,770	16,640	11,630	10,610	9,930	7,550	6,700	6,700	5,850
19	11,120	14,930	32,080	31,460	16,260	11,460	9,930	10,100	7,380	7,210	6,530	6,020
20	11,290	14,930	32,080	31,150	16,070	11,800	10,100	9,930	7,380	7,550	6,700	6,190
21	11,120	15,120	32,700	30,530	15,690	11,980	9,930	9,930	7,380	6,870	6,870	6,190
22	11,120	14,930	34,680	29,910	14,930	12,340	10,100	10,270	7,040	7,720	6,700	6,190
23	11,290	14,740	36,700	29,020	14,550	12,700	10,100	9,930	8,060	7,040	7,040	6,700
24	11,290	14,740	39,500	28,440	14,550	12,340	10,270	9,590	6,530	7,040	6,530	6,500
25	11,120	14,550	42,090	27,570	14,170	12,700	10,440	9,760	6,700	7,550	6,360	6,533
26	11,120	14,170	43,200	26,700	14,550	12,700	10,270	9,590	7,720	6,870	6,360	6,530
27	11,460	13,980	42,830	26,180	14,550	12,160	10,270	9,760	8,570	6,700	6,360	6,700
28	11,290	14,170	43,200	25,920	13,790	11,980	10,440	9,420	6,700	6,870	6,190	6,530
29	11,630	......	42,460	24,880	12,700	11,980	10,610	9,760	6,530	7,380	6,190	6,870
30	11,460	......	42,460	24,620	12,880	12,160	10,610	9,930	6,700	6,870	6,190	6,700
31	12,340	......	41,720	......	12,700	......	10,270	9,590	......	6,870	......	6,870
Mean	11,200	14,063	29,445	34,186	17,618	11,709	10,813	10,166	8,117	6,848	6,672	6,245

Estimated Monthly Discharge of Lake Champlain, at Fort Montgomery, N. Y.

[Drainage area, 7,750 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January	**12,340**	**11,120**	**11,200**	**1.44**	**1.66**
February	**15,120**	**12,520**	**14,063**	**1.81**	**1.88**
March	**43,200**	**15,310**	**29,445**	**3.80**	**4.38**
April	**43,940**	**24,620**	**34,186**	**4.41**	**4.92**
May	**26,700**	**12,700**	**17,618**	**2.27**	**2.62**
June	**12,700**	**10,440**	**11,709**	**1.51**	**1.68**
July	**11,980**	**9,930**	**10,813**	**1.39**	**1.60**
August	**13,980**	**9,420**	**10,166**	**1.31**	**1.51**
September	**9,930**	**6,530**	**8,117**	**1.05**	**1.17**
October	**7,890**	**6,020**	**6,848**	**.88**	**1.01**
November	**7,550**	**6,020**	**6,672**	**.86**	**.96**
December	**6,870**	**5,850**	**6,245**	**.81**	**.93**
The year	....	....	....	....	**24.32**

[a] Discharge taken from nearest .05 foot gauge reading.

SARANAC RIVER AT LOZIER'S DAM, NEAR PLATTSBURG, CLINTON COUNTY, N. Y.

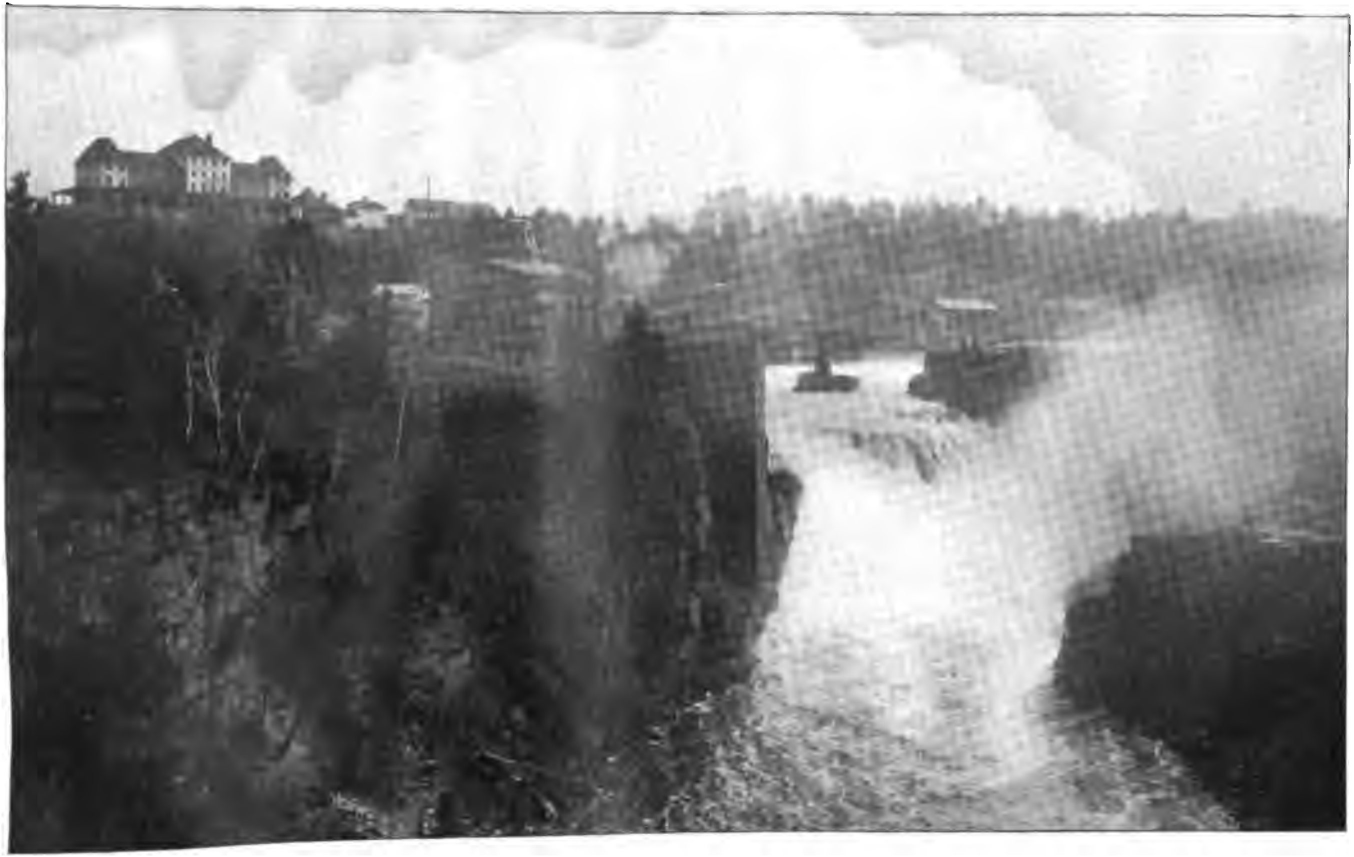
A gauging station was established at this dam March 27, 1903. The record includes the flow over a straight spillway crest 190 feet in length; the discharge through two 5-foot waste gates when open, and the discharge through four 33-inch Victor turbines, controlled by automatic governors. Experiments have been made at Cornell University Hydraulic Laboratory on a model of the ogee section of the dam, from which coefficients have been derived for calculation of the discharge. The gauges are read and the record furnished by A. E. Hare, Observer.

The drainage basin of the stream, which is tributary to Lake Champlain at Plattsburg, is described in connection with gaugings at the State dam near Saranac Lake.

SARANAC RIVER AT PLATTSBURG.

Flow in Second-feet, Saranac River, at Plattsburg, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	1,092	846	392	669	1,320	545	426	706	575
2	......	......	......	1,778	736	274	1,593	1,002	564	501	708	590
3	......	......	......	1,778	658	392	1,419	846	669	638	473	583
4	......	......	......	3,924	669	333	1,002	712	470	615	531	615
5	......	......	......	2,920	712	168	849	626	496	670	601	648
6	......	......	......	2,231	626	363	755	581	405	613	637	515
7	......	......	......	2,166	613	529	669	333	430	574	746	730
8	......	......	......	2,517	526	274	626	600	581	572	658	659
9	......	......	......	2,662	276	245	626	572	304	584	734	579
10	......	......	......	2,373	136	333	364	846	449	1,214	772	584
11	......	......	......	2,093	254	392	206	846	392	1,334	768	617
12	......	......	......	1,759	689	624	486	2,332	476	1,035	692	543
13	......	......	......	1,698	545	1,384	474	1,573	443	750	771	517
14	......	......	......	1,095	545	1,218	474	1,197	505	701	611	640
15	......	......	......	1,093	583	306	474	994	......	627	443	522
16	......	......	......	1,593	486	755	592	706	411	427	911	574
17	......	......	......	1,093	405	247	705	755	411	472	728	486
18	......	......	......	1,462	583	545	599	693	362	801	695	417
19	......	......	......	1,450	583	545	830	755	512	1,108	730	488
20	......	......	......	1,073	507	725	669	1,037	529	1,037	647	449
21	......	......	......	1,415	268	1,392	1,090	941	667	775	622	818
22	......	......	......	1,711	507	1,714	894	919	505	688	592	664
23	......	......	......	1,734	515	969	1,037	706	505	611	736	679
24	......	......	......	1,523	486	306	1,247	712	333	588	709	689
25	......	......	......	1,447	545	1,194	919	432	274	615	605	722
26	......	......	......	1,054	608	1,067	615	626	361	696	528	838
27	......	......	2,229	941	644	864	755	626	195	502	575	555
28	......	......	2,736	306	238	658	755	626	212	562	550	722
29	......	......	2,300	306	356	712	669	599	545	565	443	609
30	......	......	1,839	894	425	669	941	572	451	517	601	610
31	......	......	1,592	......	486	......	1,300	693	......	557	......	571
Mean	......	......	2,139	1,639	518	652	768	831	448	689	651	607



Au Sable River: At head of Au Sable Chasm, 5½ miles from discharge into Lake Champlain, Clinton County, N. Y.

SARANAC RIVER AT PLATTSBURG.

Estimated Monthly Discharge of Saranac River, at Plattsburg, N. Y.

[Drainage area, 624 square miles.]

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	3,924	306	1,639	2.62	2.92
May	846	136	518	.83	.95
June	1,714	168	652	1.04	1.16
July	1,593	206	768	1.23	1.42
August	2,332	333	831	1.33	1.53
September	669	195	448	.72	.80
October	1,334	426	689	1.10	1.27
November	772	443	651	1.04	1.16
December	838	417	607	.97	1.12
The year	....	....	....	....	....

SARANAC RIVER, NEAR SARANAC LAKE, FRANKLIN COUNTY, N. Y.

The headwaters of Saranac River lie in southern Franklin County. The southern boundary of the drainage basin is the Ampersand Mountain Range. The stream drains the north slope of the most elevated region of the State. To the northwest of Ampersand Range is a region of lakes and ponds in which region arise three of the principal streams of the St. Lawrence-Champlain drainage in New York State, St. Regis, Raquette, and Saranac Rivers.

In 1854, a timber dam was built below Lower Saranac Lake for the purpose of flooding logs. In 1899-1901, a masonry dam and lock were erected by the State at this point, raising the water-level of Lower Saranac Lake 18 inches.

Drainage Areas of Saranac River. [a]

LOCATION.	Area, point to point.	Total square miles.
Above Saranac Lake State Dam	....	157.5
Above Saranac Lake Village	44.9	202.4
Above Franklin Falls	104.3	306.7
North Branch Saranac River	186.6	186.6
At junction North branch	....	498.8
Above High Falls	19.6	518.4
Above Cadyville	74.6	593.0
Above Kent Falls	2.9	595.9
Above Morrisonville	2.0	597.9
Above Lozier Dam	26.1	624.0
Above mouth	5.6	629.6

The drainage basin above the State Dam is in part very precipitous, and is almost entirely forest covered. The surface areas of several lakes and ponds are as follows:[b]

	Square miles water surface.
Upper Saranac Lake	8.5
Middle Saranac Lake	2.5
Lower Saranac Lake	3.5
Big Clear Pond	2.0
Follensby's Pond	2.0
Combined area thirty other lakes and ponds	7.0
Total water surface area	25.5

About 16.2 per cent. of the upper drainage area is water surface.

Saranac River enters Lake Champlain at Plattsburg, and owing to its somewhat equalized flow and rapid fall presents numerous opportunities for power development.

During the months of July and August, 1902, a series of gauge readings were taken at the State Dam under direction of the late Elnathan Sweet, C. E. In March, 1903, a gauge was erected in the pond above this dam and observations of the depth of overflow, opening of wasteway and lockage, were taken during the navigation season, May 17 to October 31, 1903, inclusive, by Ben R. Baker. The dam is of masonry, eight feet high, has a nearly vertical downstream face and an upstream inclination of the coping of the crest of one foot in six feet, backed by slope paving with a batter of three horizontal to one vertical. Coefficients of discharge have been taken from the experiments at Cornell University Hydraulic Laboratory.

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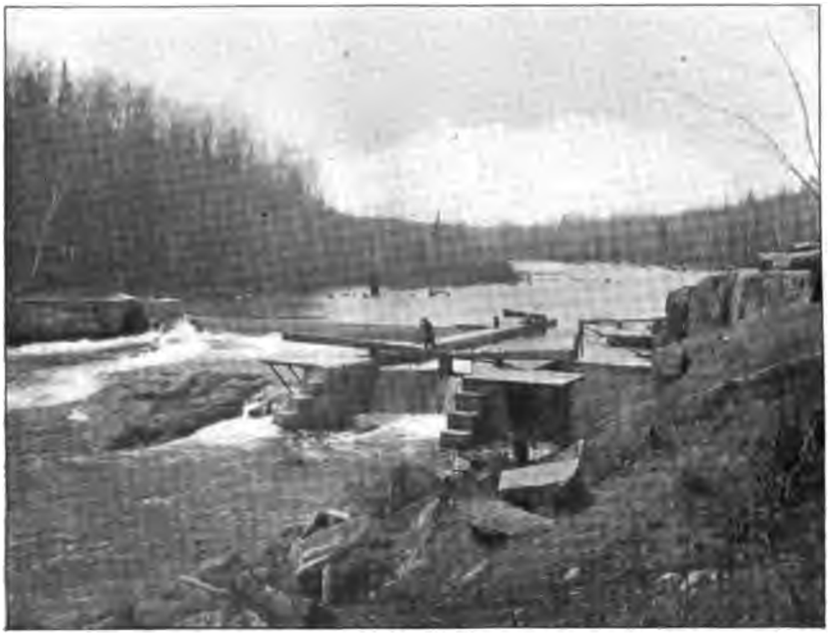
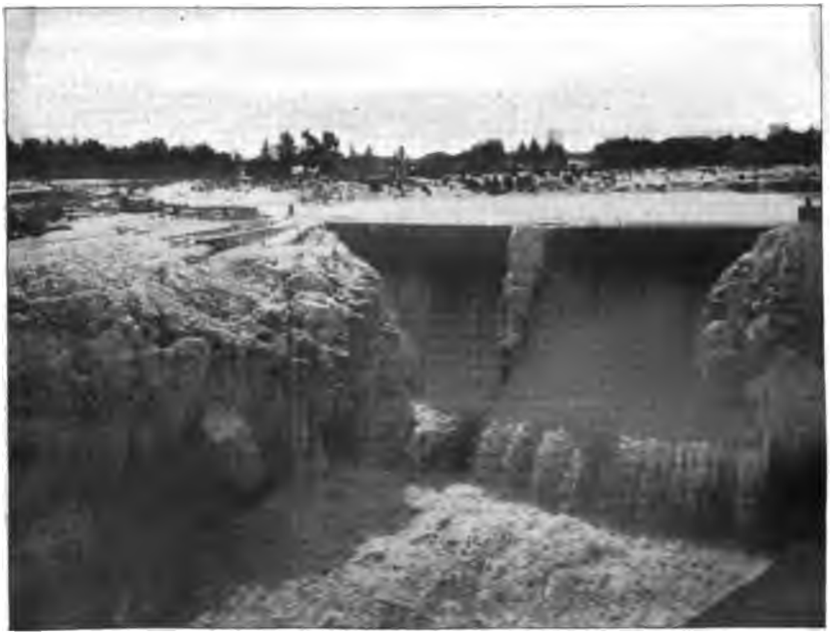
[a] From Bien's Atlas of New York State.
[b] From Bien's Atlas of New York.



State Dam and Lock on Saranac River, 4½ Miles Above Saranac Lake Village, Franklin County, N. Y.



Saranac River, Dam No. 10 at Cadyville, Clinton County, N. Y.

SARANAC RIVER, N. Y.

SARANAC RIVER AT SARANAC LAKE.

Mean Daily Discharge, Second-Feet, of Saranac River, at State Dam, near Saranac Lake, New York.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
1	......	......	......	......	......	......	......	141	......	......	......	......
2	......	......	......	......	......	......	......	163	......	......	......	......
3	......	......	......	......	......	......	......	......	......	......	......	......
4	......	......	......	......	......	......	......	212	......	......	......	......
5	......	......	......	......	......	......	......	198	......	......	......	......
6	......	......	......	......	......	......	......	198	......	......	......	......
7	......	......	......	......	......	......	......	212	......	......	......	......
8	......	......	......	......	......	......	......	204	......	......	......	......
9	......	......	......	......	......	......	......	212	......	......	......	......
10	......	......	......	......	......	......	......	......	......	......	......	......
11	......	......	......	......	......	......	......	181	......	......	......	......
12	......	......	......	......	......	......	......	225	......	......	......	......
13	......	......	......	......	......	......	......	212	......	......	......	......
14	......	......	......	......	......	......	......	198	......	......	......	......
15	......	......	......	......	......	......	......	201	......	......	......	......
16	......	......	......	......	......	......	......	193	......	......	......	......
17	......	......	......	......	......	......	......	......	......	......	......	......
18	......	......	......	......	......	......	......	186	......	......	......	......
19	......	......	......	......	......	......	......	186	......	......	......	......
20	......	......	......	......	......	......	......	178	......	......	......	......
21	......	......	......	......	......	......	......	174	......	......	......	......
22	......	......	......	......	......	......	......	174	......	......	......	......
23	......	......	......	......	......	......	......	174	......	......	......	......
24	......	......	......	......	......	......	......	......	......	......	......	......
25	......	......	......	......	......	......	188	174	......	......	......	......
26	......	......	......	......	......	......	148	174	......	......	......	......
27	......	......	......	......	......	......	......	174	......	......	......	......
28	......	......	......	......	......	......	156	156	......	......	......	......
29	......	......	......	......	......	......	188	......	......	......	......	......
30	......	......	......	......	......	......	131	......	......	......	......	......
31	......	......	......	......	......	......	128	......	......	......	......	......
1903.												
1	......	......	......	......	......	104	208	228	170	......	......	......
2	......	......	......	......	......	104	189	228	170	......	......	......
3	......	......	......	......	......	104	189	228	170	......	......	......
4	......	......	......	......	......	90	170	208	170	......	......	......
5	......	......	......	......	......	76	170	208	189	......	......	......
6	......	......	......	......	......	76	170	208	189	......	......	......
7	......	......	......	......	......	76	170	208	189	......	......	......
8	......	......	......	......	......	76	170	208	170	......	......	......
9	......	......	......	......	......	64	170	208	170	......	......	......
10	......	......	......	......	......	64	170	208	162	......	......	......
11	......	......	......	......	......	64	170	228	145	......	......	......
12	......	......	......	......	......	52	170	238	136	......	......	......
13	......	......	......	......	......	......	170	218	136	......	......	......
14	......	......	......	......	......	76	170	208	136	......	......	......
15	......	......	......	......	......	90	170	208	136	......	......	......
16	......	......	......	......	......	104	170	208	136	......	......	......
17	......	......	......	......	162	128	170	208	136	......	......	......
18	......	......	......	......	136	153	153	208	128	......	......	......
19	......	......	......	......	128	153	136	208	120	......	......	......
20	......	......	......	......	136	153	136	218	104	......	......	......
21	......	......	......	......	136	170	153	228	104	......	......	......
22	......	......	......	......	......	189	170	228	104	......	......	......
23	......	......	......	......	136	189	170	228	104	......	......	......
24	......	......	......	......	120	189	170	208	104	......	......	......
25	......	......	......	......	104	189	170	208	104	......	......	......
26	......	......	......	......	104	208	170	208	104	......	......	......
27	......	......	......	......	104	208	170	208	104	......	......	......
28	......	......	......	......	104	208	170	208	90	......	......	......
29	......	......	......	......	104	208	180	198	90	......	......	......
30	......	......	......	......	104	208	228	189	83	......	......	......
31	......	......	......	......	104	......	228	180	......	......	......	......
Mean	......	......	......	......	120	130	173	212	136	......	......	......

Estimated Monthly Discharge of Saranac River, at Saranac Lake, N. Y.
[Drainage area, 158 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May 17 to 31	....	104	120	.760	....
June	208	52	130	.823	.91
July	228	136	173	1.095	1.27
August	228	180	212	1.342	1.54
September	189	83	136	.861	.95
October	....	....	....	....	....
November	....	....	....	....	....
December	....	....	....	....	....

MOHAWK RIVER DRAINAGE.[a]

SCHOHARIE CREEK AT MILL POINT, MONTGOMERY COUNTY, N. Y.

A gauging station was established at the highway bridge at Mill Point July 6, 1900, and readings have been taken once each day, usually at 9 a. m., by Wm. H. Merry. The record was discontinued September 26, 1903, a gauge having been erected and a record of the river height established for purposes of the flood prediction for the U. S. Weather Bureau.

The accompanying table shows the daily observations of the stream height as taken. A current meter measurement by E. P. Roundey, May 30, 1903, showed a discharge of 196 C. F. S. at Mill Point.[b]

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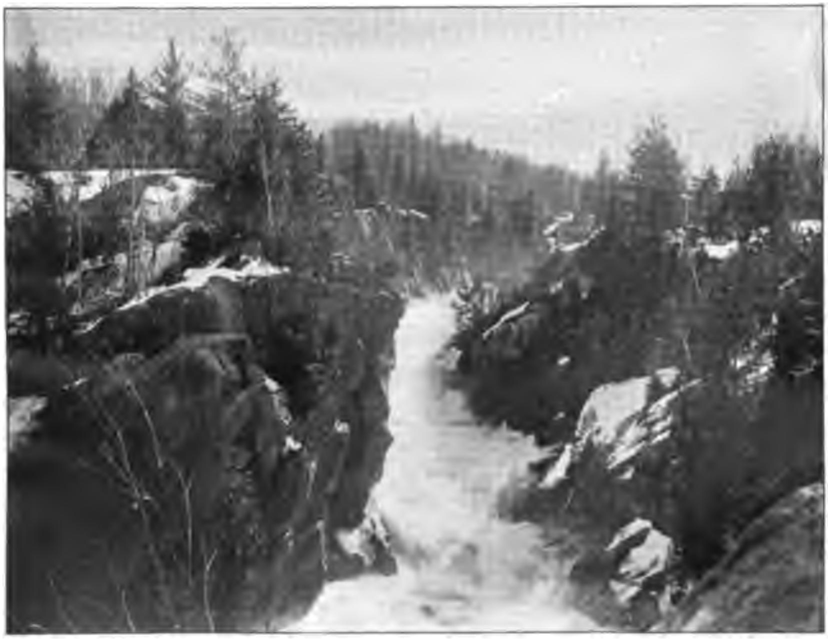
[a] Records for the following named stations have been omitted from the present report:
Mohawk River at Dunsbach Ferry, N. Y.
Schoharie Creek at Schoharie Falls, N. Y.
East Canada Creek, Dolgeville, N. Y.
Mohawk River at Little Falls, N. Y.
Oriskany Creek at Wood Road Bridge, Oriskany, N. Y.
Miscellaneous Gaugings.
Descriptions of most of these stations, with data for preceding years, will be found in Report on Stream Gaugings contained in Supplement, Report of State Engineer and Surveyor of New York for 1902.

[b] For additional data of discharge of Lower Schoharie Creek, see Report on Stream Gaugings, contained in Supplement Report of State Engineer and Surveyor, 1902, pages 169-180.

High Falls, Double Cascade.



High Falls, Looking Upstream, showing dip of strata with bench on left suitable for location of penstock.

Saranac River, N. Y.

Daily Gauge Height, Feet, of Schoharie Creek, at Mill Point, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	2.15	2.54	7.93	3.57	1.31	2.20	3.59	2.58	4.76	......	......	......
2	2.25	2.44	4.43	2.87	1.21	2.20	3.49	2.53	4.31	......	......	......
3	2.20	2.64	2.93	2.72	1.16	2.15	3.39	2.48	4.21	......	......	......
4	3.60	3.04	2.78	2.62	1.11	2.10	3.29	2.43	3.46	......	......	......
5	2.90	4.04	2.63	2.57	1.11	2.15	3.19	2.38	3.31	......	......	......
6	2.60	3.54	2.53	2.37	1.06	1.82	3.04	3.38	3.26	......	......	......
7	2.10	3.29	2.63	2.27	1.01	2.20	2.79	3.28	3.21	......	......	......
8	2.05	3.09	3.18	2.27	.86	2.25	2.69	3.28	3.06	......	......	......
9	1.95	2.54	5.33	2.32	.81	2.20	2.64	3.28	2.86	......	......	......
10	1.95	2.24	4.23	2.37	.66	2.25	2.59	3.43	2.71	......	......	......
11	1.90	2.09	5.73	2.27	.46	2.20	2.54	3.38	2.56	......	......	......
12	1.95	4.24	4.28	2.22	.61	2.95	2.49	3.23	2.41	......	......	......
13	2.00	3.14	3.53	2.12	.76	5.45	2.44	2.73	2.41	......	......	......
14	2.00	2.64	3.28	2.12	.46	3.90	2.34	2.58	2.36	......	......	......
15	1.95	2.34	3.03	2.07	.11	4.15	2.29	2.53	2.31	......	......	......
16	1.95	2.24	2.78	3.07	.41	4.65	2.29	2.48	2.26	......	......	......
17	1.90	1.99	2.58	2.57	.86	4.10	2.29	2.48	2.21	......	......	......
18	1.90	1.84	2.53	2.32	.86	3.65	2.24	2.43	2.21	......	......	......
19	1.95	1.79	2.53	2.17	.31	3.55	2.19	2.38	2.16	......	......	......
20	2.05	1.69	2.48	1.92	1.56	3.40	2.24	2.88	2.16	......	......	......
21	2.00	1.64	2.48	1.82	2.46	4.80	2.29	2.83	2.16	......	......	......
22	1.95	1.64	2.63	1.72	1.61	6.30	2.34	2.78	2.11	......	......	......
23	1.95	1.59	5.01	1.67	1.86	5.30	2.39	2.63	2.11	......	......	......
24	1.95	1.54	6.83	1.62	1.81	6.05	2.59	2.48	2.06	......	......	......
25	1.80	1.54	4.13	1.57	2.31	5.35	2.54	2.48	2.11	......	......	......
26	1.70	1.49	3.33	1.52	2.21	4.30	2.44	2.78	2.16	......	......	......
27	1.70	1.49	2.93	1.47	1.81	4.15	2.29	3.48	......	......	......	......
28	1.75	1.69	2.58	1.42	2.11	3.95	2.29	3.38	......	......	......	......
29	1.90	......	2.53	1.42	2.16	3.40	2.24	4.18	......	......	......	......
30	4.70	......	2.48	1.37	2.01	3.50	2.34	5 68	......	......	......	......
31	3.45	......	3.98	......	2.16	......	2.39	5.38	......	......	......	......

SCHOHARIE CREEK AT PRATTSVILLE, GREENE COUNTY, N. Y.

Schoharie Creek above Prattsville drains a rugged mountainous area almost entirely wooded. The watershed, embracing an area of 243 square miles, lies wholly within Greene county. The basin is surrounded by continuous mountain ranges, and intervening ridges divide the main stream from its principal tributaries, Batavia Kill, East Kill and West Kill.

A gauging station was established at the highway bridge in Prattsville village November 7, 1902, by C. C. Covert; the gauge datum is referred to the U. S. Geological Survey bench mark, an "O" marked on a boulder on right-hand end of bridge on the downstream side; elevation 1,151 feet. A fifteen-foot weight and wire gauge, having a boxed horizontal scale is attached to the steel floor beams of the bridge, on the upstream side. The elevation of the water surface when the gauge reads zero is 1,130.03. The bridge has a single span of 185 feet.

The current-meter discharge measurements, shown in the accompanying list, have been made. From these a rating table for the cross-section of the stream will be deduced and the daily discharge and run-off calculated.

Current-meter Discharge Measurements, of Schoharie Creek, at Prattsville, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-feet.
	1902.			
November	7	C. C. Covert	5.56	342
December	4	F. H. Tillinghast	5.60	345
	1903.			
February	5	F. H. Tillinghast	6.60	*a* 1,042
March	10	F. H. Tillinghast	6.92	1,611
May	7	F. H. Tillinghast	5.10	136
May	14	F. H. Tillinghast	5.00	99
May	15	F. H. Tillinghast	5.02	111
June	4	F. H. Tillinghast	4.72	82
June	15	F. H. Tillinghast	8.06	3,200
June	30	F. H. Tillinghast	5.96	652
July	18	F. H. Tillinghast	4.86	55
August	26	F. H. Tillinghast	6.29	806
August	30	F. H. Tillinghast	7.62	2,173

Daily Gauge Height, Feet, of Schoharie Creek, at Prattsville, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.
1903.												
1	5.63	5.95	7.72	6.62	5.25	4.75	5.75	4.98	7.10	4.95	5.10	5.00
2	5.65	5.68	6.68	6.18	5.22	4.75	5.58	4.90	6.20	4.98	5.00	5.10
3	6.13	6.65	6.32	6.18	5.22	4.75	5.40	4.90	5.80	4.95	4.95	5.10
4	6.25	6.80	6.12	6.35	5.20	4.75	5.20	4.92	5.50	4.95	4.92	5.10
5	5.85	6.25	6.07	6.10	5.18	4.75	5.20	5.82	5.48	4.95	4.90	5.08
6	5.70	6.05	6.05	6.00	5.10	4.72	5.20	5.85	5.48	5.00	......	4.95
7	5.70	6.05	5.90	6.00	5.10	4.72	5.18	5.78	5.40	4.98	4.98	4.90
8	5.68	5.90	6.30	6.15	5.10	4.72	5.10	5.45	5.38	6.20	4.92	4.90
9	5.65	5.85	7.38	7.00	5.10	4.85	5.02	5.30	5.25	19.95	4.92	4.88
10	5.65	5.75	7.00	6.40	5.05	4.78	5.00	5.82	5.20	9.80	4.90	4.80
11	5.70	5.70	8.12	6.15	5.08	4.90	5.00	5.22	5.22	8.35	4.88	4.80
12	5.70	6.90	7.25	6.00	5.00	7.88	4.95	5.20	5.20	7.35	4.88	4.80
13	5.65	6.20	6.78	5.88	4.97	7.28	4.90	5.12	5.12	6.55	4.85	4.80
14	5.65	5.80	6.55	5.80	5.00	6.90	4.90	5.10	5.12	6.20	4.80	5.95
15	5.70	5.72	6.78	6.75	5.00	7.25	4.90	5.00	5.02	5.95	4.80	5.80
16	5.70	6.10	6.55	6.45	5.00	7.20	4.85	5.00	5.10	5.70	4.82	5.70
17	5.65	6.15	6.42	6.35	4.95	6.35	4.85	5.00	5.12	5.62	5.42	5.70
18	5.65	6.20	6.25	6.15	4.90	6.05	4.88	5.00	5.88	5.65	5.78	5.60
19	5.63	6.20	6.15	5.98	4.90	5.80	4.95	5.00	5.45	5.62	6.00	5.60
20	5.65	6.20	6.10	5.85	4.85	5.65	5.00	6.55	5.20	5.48	5.65	7.50
21	5.70	6.20	6.22	5.78	4.85	7.05	5.65	6.30	5.18	5.35	5.90	7.85
22	5.78	6.20	8.20	5.68	4.85	6.95	5.58	6.15	5.10	5.30	5.20	6.25
23	5.62	6.25	9.77	5.40	4.85	6.68	5.32	6.08	5.08	5.25	5.22	5.80
24	5.65	6.17	8.40	5.60	4.85	7.62	5.18	5.88	5.05	5.28	5.20	5.70
25	5.61	6.10	7.25	5.50	4.80	6.75	5.02	5.95	5.02	5.25	5.18	5.68
26	6.00	5.95	6.75	5.50	4.80	6.30	4.98	6.15	5.00	5.22	5.25	5.55
27	5.90	6.88	6.38	5.45	4.80	5.95	4.92	5.72	5.00	5.18	5.30	5.35
28	6.30	10.56	6.10	5.38	4.80	5.75	4.90	6.35	5.05	5.18	......	5.40
29	6.98	......	6.05	5.32	4.80	5.80	4.92	8.76	5.02	5.18	5.20	5.48
30	7.55	......	5.90	5.28	4.80	6.18	5.12	7.82	5.00	5.12	5.06	5.62
31	6.22	......	7.50	......	4.78	......	5.02	7.75	......	5.10	......	5.60

a Creek full of ice.

SPRUCE CREEK AT DOLGEVILLE, N. Y.

Spruce Creek is a tributary of East Canada Creek, entering the latter stream at Dolgeville. Spruce Creek and Beaver Brook, one of its tributaries entering at Salisbury, furnish the water supply of Little Falls.

The watersheds of Spruce and Beaver streams are shown on the Little Falls sheet, No. 142, of the U. S. Topographic atlas.

At Salisbury Inlet on Spruce Creek, a masonry dam 16 feet high, built in 1899, floods the foot of an extensive swamp area, impounding a stated volume of 150,000,000 gallons to spillway level. An additional reservoir in the headwaters of the stream receives the drainage from 1.0 square mile, and has an estimated capacity of 756,306,000 gallons.

October 20 to November 5, 1901, a series of current meter measurements of Spruce Creek at a point just above the mouth of the stream were made by Joseph Kemper, C. E., with large Price meter No. 89.

The gauge heights and measured discharge are given in the accompanying table. Owing to draught from and supply to storage as well as diversion to Little Falls conduit, the measurements do not show the natural yield of the watershed. They do show, however, the net supply to East Canada Creek from Spruce Creek during the period of measurement, which was the driest portion of the summer of 1901. No rainfall occurred during the continuation of the measurements.

The drainage areas of Spruce and Beaver streams are as follows:[a]

LOCATION.	Square miles.
Spruce Creek above Salisbury Dam	36.2
Spruce Creek above junction Beaver Brook	37.0
Beaver Brook above Intake Dam	6.3
Beaver Creek above mouth	6.7
Spruce Creek below junction Beaver Brook	43.7
Spruce Creek above mouth	50.4

[a] From U. S. Geol. Survey Topographic map No. 142.

Additional data regarding water power on Spruce Creek may be found in U. S. G. S. Water Supply Paper No. 65, p. 160.

Measured Discharge of Spruce Creek near mouth, at Dolgeville, N. Y.

DATE.	Gauge height, feet.	Second-feet.	Second-feet, per square mile.
1901.			
October 20	1.10	61.8	1.24
October 21	1.15	61.7	1.23
October 22	1.13	60.1	1.20
October 23	1.08	49.1	.98
October 24	1.00	39.1	.78
October 25	1.11	57.2	1.14
October 26	1.03	51.1	1.02
October 27	.91	33.7	.67
October 28	1.02	41.4	.83
October 30	1.08	48.3	.97
October 31	1.05	50.2	1.00
November 1	.95	34.1	.68
November 2	1.08	51.0	1.02
November 3	.82	25.1	.50
November 4	.92	30.7	.61
November 5	.93	30.7	.61

BEAVER BROOK, HERKIMER COUNTY, N. Y.

Beaver Brook is tributary to Spruce Creek at Diamond Hill, flowing in from the west. The drainage basin is shown on the Little Falls quadrangle, No. 142, of U. S. Topographic map. The stream serves, in conjunction with Spruce Creek, as a source of water supply by gravity, to the city of Little Falls. The stream valley is overlaid with sand and gravel. The slopes are moderate and rounded, the total rise from the mouth of the stream to the divide being 400 to 500 feet. The tributaries are short and not numerous, heading as a rule at considerable distance below the divide. There is no swamp or lake storage. Two weirs were erected on the stream and gauge readings taken irregularly from September 11, 1900, to November 9, 1901, inclusive.

The lower weir was situated just above the Little Falls Intake Dam and had a level crest 10 feet in length with a thin metal edge. There were two end contractions, and, ordinarily, no appreciable velocity of approach. The upper weir, situated one and one-half miles upstream, had a crest length of 6 feet. The Francis formula has been used in the calculations.

The weirs were erected and the measurements made for the most part by John B. Keottritz, C. E., by whom the data has been furnished. Mr. Keottritz states that the larger second-feet per square mile yield of Beaver Brook at the upper weir is due to numerous springs above the upper weir, the inflow between upper and lower weirs being surface drainage.

Low Water Measurements of Beaver Brook near Diamond Hill, Herkimer County, N. Y.

MONTH.	Precipitation.	UPPER WEIR DRAINAGE AREA=1.95 SQUARE MILES.		LOWER WEIR DRAINAGE AREA=6 SQUARE MILES.	
		Second-feet.	Second-feet per square mile.	Second-feet.	Second-feet per square mile.
1900.					
September 11	....	1.95	1.0	....	....
12	0.15	2.09	1.07	....	....
13	....	1.89	.97	....	....
14	....	....	....	....	....
15	....	....	....	....	....
16	.07	....	....	....	....
17	....	....	....	....	....
18	....	....	....	....	....
19	....	....	....	2.50	.42
20	.30	2.29	1.17	3.15	.52
21	.75	....	....	....	....
22	....	2.25	1.15	4.09	.68
23	....	....	....	....	....
24	....	2.14	1.09	3.17	.53
25	....	....	....	....	....
26	....	....	....	2.73	.45
27	.05	....	....	3.56	.59
28	....	....	....	....	....
29	.30	....	....	....	....
30	.10	....	....	....	....
October 1	....	....	....	3.33	.56
2	....	....	....	....	....
3	....	1.95	1.0	....	....
4	....	....	....	3.10	.51
5	....	2.10	1.08	2.89	.48
6	....	....	....	....	....
7	....	2.07	1.06	2.75	.46
8	.24	....	....	....	....
9	....	2.19	1.12	3.26	.54
10	....	....	....	....	....
11	....	....	....	....	....
12	....	2.12	1.09	3.06	.51
13	....	....	....	....	....
14	.65	....	....	....	....
15	....	....	....	5.47	.91
16	.19	....	....	....	....
17	....	2.24	1.15	3.92	.65
18	....	....	....	....	....
19	....	....	....	3.24	.54
20	....	....	....	....	....
21	....	2.16	1.11	3.03	.51
22	....	....	....	....	....
23	....	2.22	1.14	3.30	.55
24	.85	....	....	....	....
25	....	....	....	5.09	.85
26	....	....	....	....	....
27	.25	....	....	6.31	1.05
28	....	....	....	....	....
29	....	2.43	1.25	3.42	.57
30	.10	....	....	....	....
31	.35	....	....	....	....
November 1	....	....	....	6.30	1.05
2	....	....	....	....	....
3	....	2.22	1.14	3.99	.67
4	....	....	....	....	....
5	....	....	....	....	....
6	.30	....	....	....	....
7	.25	....	....	....	....
8	.30	....	....	11.61	1.93
9	.20	....	....	....	....
10	....	....	....	....	....
11	....	....	....	....	....
12	....	....	....	....	....
13	.05	....	....	5.63	.94
14	....	....	....	5.66	.94
15	.05	....	....	....	....
16	....	....	....	....	....

Low Water Measurements of Beaver Brook near Diamond Hill, Herkimer County, N. Y.

MONTH.		Precipitation.	UPPER WEIR DRAINAGE AREA=1.95 SQUARE MILES.		LOWER WEIR DRAINAGE AREA=6 SQUARE MILES.	
			Second-feet.	Second-feet per square mile.	Second-feet.	Second-feet per square mile.
	1900.					
November	17	....	....	....	4.90	.82
	18	....	....	....	5.39	.90
	19	.81	....	....	....	....
	20	.80	....	....	....	....
	21	.40	....	....	....	....
	1901.					
July	25	.10	....	....	....	....
	26	.10	....	....	....	....
	27	....	....	....	....	....
	28	.25	....	....	....	....
	29	.35	....	....	....	....
	30	....	....	....	....	....
	31	.10	....	....	....	....
August	1	....	....	....	....	....
	2	....	....	....	....	....
	3	.17	....	....	....	....
	4	....	....	....	....	....
	5	....	....	....	....	....
	6	.17	....	....	....	....
	7	1.10	....	....	....	....
	8	.18	....	....	....	....
	9	....	....	....	....	....
	10	.90	....	....	....	....
	11	....	....	....	....	....
	12	....	....	....	....	....
	13	....	....	....	....	....
	14	....	....	....	....	....
	15	1.10	....	....	....	....
	16	....	....	....	....	....
	17	....	2.67	1.34	4.39	.73
	18	....	....	....	....	....
	19	....	....	....	....	....
	20	....	....	....	....	....
	21	....	3.10	1.59	3.65	.61
	22	....	....	....	....	....
	23	....	2.76	1.42	3.40	.56
	24	.72	....	....	....	....
	25	....	2.58	1.32	3.60	.60
	26	....	....	....	....	....
	27	....	2.68	1.37	3.26	.54
	28	....	....	....	3.12	.52
	29	....	2.50	1.28	....	....
	30	Trace.	....	....	3.77	.63
	31	.15	3.01	1.54	....	....
September	1	.52	....	....	....	....
	2	.30	2.93	1.50	4.31	.72
	3	1.00	....	....	....	....
	4	....	4.31	2.21	....	....
	5	....	....	....	....	....
	6	....	2.85	1.46	....	....
	7	....	....	....	....	....
	8	....	2.52	1.29	....	....
	9	....	2.70	1.38	....	....
	10	....	....	....	....	....
	11	....	....	....	....	....
	12	.87	....	....	....	....
	13	....	3.28	1.68	7.72	1.29
	14	....	....	....	....	....
	15	.90	....	....	....	....
	16	....	3.23	1.66	7.23	1.20
	17	.40	....	....	....	....
	18	....	3.14	1.61	6.67	1.11
	19	....	....	....	....	....
	20	....	2.88	1.48	4.41	.74
	21	....	....	....	....	....
	22	....	2.80	1.43	4.34	.72
	23	....	....	....	....	....

Low Water Measurements of Beaver Brook near Diamond Hill, Herkimer County, N. Y.

MONTH.	Precipitation.	UPPER WEIR DRAINAGE AREA=1.95 SQUARE MILES.		LOWER WEIR DRAINAGE AREA=6 SQUARE MILES.	
		Second-feet.	Second-feet per square mile.	Second-feet.	Second-feet per square mile.
1901.					
September 24	....	2.86	1.47	3.42	.57
25	....	....	....	....	....
26	....	2.67	1.37	3.49	.58
27	....	....	....	....	....
28	....	....	....	....	....
29	.84	4.26	2.19	12.07	2.01
30	.18	....	....	....	....
October 1	....	....	....	....	....
2	.55	....	....	....	....
3	....	....	....	....	....
4	....	....	....	....	....
5	....	....	....	....	....
6	.58	....	....	....	....
7	....	3.12	1.60	5.65	.94
8	....	....	....	....	....
9	....	2.93	1.50	4.69	.78
10	....	....	....	....	....
11	....	2.96	1.52	4.80	.80
12	....	....	....	....	....
13	.65	3.09	1.59	5.33	.89
14	....	....	....	....	....
15	....	3.69	1.89	9.01	1.50
16	....	....	....	....	....
17	.29	....	....	....	....
18	.15	....	....	....	....
19	....	....	....	6.39	1.06
20	....	....	....	....	....
21	....	....	....	....	....
22	....	3.01	1.54	5.22	.87
23	....	....	....	....	....
24	....	2.93	1.50	4.47	.75
25	....	....	....	....	....
26	....	2.90	1.48	4.42	.74
27	....	3.01	1.54	5.22	.87
28	....	....	....	....	....
29	....	....	....	....	....
30	....	....	....	....	....
31	....	....	....	4.22	.70
November 1	....	....	....	....	....
2	....	....	....	3.85	.64
3	....	....	....	....	....
4	....	....	....	3.85	.64
5	....	....	....	....	....
6	....	....	....	3.73	.62
7	....	....	....	....	....
8	.17	....	....	3.87	.65
9	.10	....	....	4.67	.78

WEST CANADA CREEK AT TWIN ROCK BRIDGE, ONEIDA COUNTY, N. Y.

A current meter gauging station was established at Twin Rock Bridge, September 7, 1900, by Robert E. Horton. A gauge board, divided decimally, is attached to the upstream side of the right-hand abutment, the coping of the abutment over the gauge being used as a bench mark. The bridge is 167.5 feet long between abutments, and consists of two spans. The bed is of gravel and cobble, and the entire flow passes underneath at all stages. In the winter the stream becomes completely ice-covered, requiring special discharge measurements. The gauge is read each morning and evening by George Rood, and the record is furnished by the Utica Gas and Electric Company. The drainage area is shown on the Utica, Little Falls, Remsen, Wilmurt, Old Forge and Canada Lakes quadrangles, U. S. Geol. Survey Topographic map, Nos. 127, 128, 140, 141, 142 and 155.

There are about fifty small lakes and a few undrained ponds in the watershed of the stream. Most of these are situated near the headwaters and above the gauging station, the largest single water surface being Honnedaga Lake, 1.4 square miles in extent. There is also a small amount of controllable storage, in reservoirs formed by three dams. Swamps and marshes are numerous in the region of the headwaters, usually adjoining lakes and tributaries and having an extent of one-half square mile or less each.

Much of the region above the gauging station is timber covered. There are extensive sand areas in the central and upper drainage basins. The soil of the upper watershed is underlaid by granitic gneiss usually at or near the surface, excepting in alluvial valleys. From a point just above Twin Rock Bridge, and extending downstream beyond Trenton Falls, the underlying geological formation is Trenton limestone.[a]

The lower drainage area is largely cleared pasture land, with gravel, loam and sand soil. The topography is rolling and becomes moderately precipitous in the upper watershed, where numerous oblate hills rise 300 to 500 feet above the general plateau. The general level slopes from elevation 2,300 feet in the headwaters to 1,000 feet in the lower and central drainage basin. The tributaries are numerous and irregularly distributed, including main branches, sub-branches and small feeders. The shape of the watershed is elongated, having its greatest breadth near the mid length. The precipitation decreases from at least 50 to 55 inches mean annual, in the region of the headwaters, to 40 or 45

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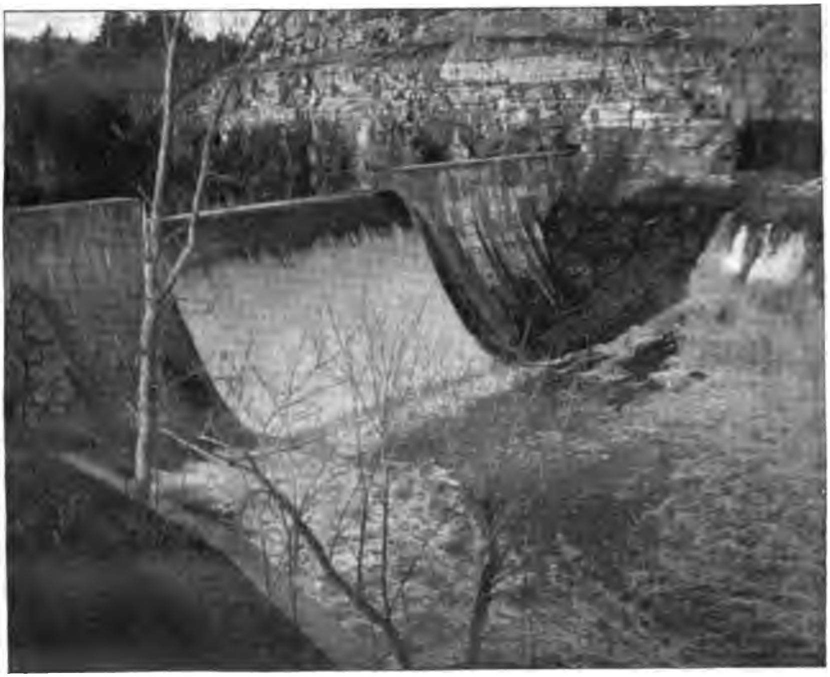
[a] For geological description of Trenton Falls, see Report of New York State Museum 1895, pp. 619–628, paper by C. S. Prosser, and E. R. Cumings.



West Canada Creek: Concrete Dam, 50 feet high, at Trenton Falls, Oneida County, N. Y.

inches at the mouth of the stream. Compacted snow accumulates in the woodlands in winter, often to a depth of three or four feet, and representing an inch of water for each five or six inches of snow. This melts slowly, feeding the stream in March and April, which months may show a run-off greatly exceeding the precipitation.

The drainage areas given below have been determined from the U. S. Geological Survey maps; as noted on preceding page.

Drainage Areas of West Canada Creek.

	SQUARE MILES.	
	Place to place.	Total.
West Canada Creek Lakes, source to foot	17.1	17.1
West Canada Lakes to Swanson Dam	28.0	45.1
Swanson Dam to Metcalf	88.5	83.6
Honnedaga Lake above outlet	5.4	
Honnedaga Lake, outlet	11.9	
Honnedaga Lake, total	17.3	100.9
Honnedaga Lake to Junction south and north branches West Canada Creek	24.7	125.6
South branch West Canada Creek above Remonda	48.3	
South branch West Canada Creek Remonda to mouth	12.5	
South branch West Canada Creek, total	60.8	186.4
West Canada Creek, Nobleboro, Junction of north and south branches to Richards	5.5	120.1
Four Mile Brook	28.2	220.1
Four Mile Brook to Twin Rock Bridge	35.6	255.7
Black Creek above Gray	27.9	27.9
Black Creek, Gray to Pardeville branch	77.0	104.9
Black Creek, Pardeville to Grant	2.0	106.9
Black Creek, Grant to mouth	1.2	108.1
Black Creek, total	108.1	363.8
Twin Rock Bridge to Hinckley Dam site	8.5	372
Hinckley site to Prospect	2.0	374
Prospect to Trenton Falls	0.9	375
Trenton Falls to Steuben Creek	6.2	381
Steuben Creek	52.3	434
Steuben Creek to Newport	45.8	480
Newport to Middleville	47.2	527
Middleville to Kast Bridge	47.5	574
Kast Bridge to mouth	8.8	583

Estimated Maximum Discharge, West Canada Creek.

Date,	LOCATION.	Drainage area, square miles.	DISCHARGE.	
			Second-feet.	Second-feet, square miles.
April 21, 1869	Hinckley Dam	372	*a b* 38,900	104.64
August, 1874	Hinckley Dam	372	*a* 21,100	56.76
August, 1898	Newport Dam	480	*a* 21,975	45.80
December 15, 1901	Trenton Falls Dam	375	*c* 36.300	96.72
October 10, 1903	Trenton Falls Dam	375	18,000	48.00

Current-meter Discharge Measurements of West Canada Creek at Twin Rock Bridge, near Hinckley, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-feet.
	1903.			
February	21	C. C. Covert	*d* 3.80	628
February	24	H. R. Beebe	*d* 3.60	651
February	25	H. R. Beebe	*d* 3.54	625
February	25	H. R. Beebe	*d* 3.52	616
March	17	C. C. Covert	*e* 4.84	8,845
March	24	C. C. Covert	12.00	15,452
March	24	C. C. Covert	11.60	11,908
March	25	C. C. Covert	7.95	7,528
March	25	C. C. Covert	7.90	7,672
April	1	C. C. Covert	5.65	4,516
April	1	C. C. Covert	5.75	4,791
May	13	H. H. Halsey	1.05	362
May	13	H. H. Halsey	1.05	393
May	14	C. C. Covert	1.15	379
May	26	H. H. Halsey	0.55	238
May	26	H. H. Halsey	0.55	242
June	2	H. H. Halsey	0.45	153
June	2	H. H. Halsey	0.50	161
June	11	H. H. Halsey	0.52	201
July	7	C. C. Covert	1.68	670
August	21	E. P. Roundey	2.40	775
August	23	E. P. Roundey	2.00	616
September	28	H. H. Halsey	0.80	301

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a Report to Utica Electric Light & Power Co., October, 1900.

b Record somewhat uncertain.

c Of very short duration at maximum intensity, may have been influenced by breaking up of log jam above.

d Measurements made under ice 1.5 feet average thickness.

e Slight reduction in discharge March 16 to August 31, inclusive, due to log-jam in stream.

Mean Daily Discharge, Second-feet, West Canada Creek at Twin Rock Bridge, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1900.												
1	......	......	......	......	......	......	......	......	......	305	330	700
2	......	......	......	......	......	......	......	......	......	270	700	885
3	......	......	......	......	......	......	......	......	......	240	415	1,010
4	......	......	......	......	......	......	......	......	......	255	392	925
5	......	......	......	......	......	......	......	......	......	225	440	808
6	......	......	......	......	......	......	......	......	......	210	770	668
7	......	......	......	......	......	......	......	......	......	240	3,433	570
8	......	......	......	......	......	......	......	......	......	305	3,095	570
9	......	......	......	......	......	......	......	......	162	270	1,863	635
10	......	......	......	......	......	......	......	......	156	330	602	635
11	......	......	......	......	......	......	......	......	162	305	1,048	635
12	......	......	......	......	......	......	......	......	156	255	925	635
13	......	......	......	......	......	......	......	......	162	225	668	635
14	......	......	......	......	......	......	......	......	162	490	700	635
15	......	......	......	......	......	......	......	......	168	515	635	400
16	......	......	......	......	......	......	......	......	280	415	635	400
17	......	......	......	......	......	......	......	......	182	392	635	400
18	......	......	......	......	......	......	......	......	151	370	845	400
19	......	......	......	......	......	......	......	......	151	350	4,562	400
20	......	......	......	......	......	......	......	......	735	440	4,315	400
21	......	......	......	......	......	......	......	......	1,731	232	4,319	400
22	......	......	......	......	......	......	......	......	1,280	225	3,319	400
23	......	......	......	......	......	......	......	......	635	1,241	2,555	480
24	......	......	......	......	......	......	......	......	350	1,356	1,010	460
25	......	......	......	......	......	......	......	......	415	808	5,515	440
26	......	......	......	......	......	......	......	......	330	770	5,450	430
27	......	......	......	......	......	......	......	......	350	1,437	3,263	420
28	......	......	......	......	......	......	......	......	370	968	2,347	400
29	......	......	......	......	......	......	......	......	305	440	925	400
30	......	......	......	......	......	......	......	......	330	465	770	......
31	......	......	......	......	......	......	......	......	......	635	......	......
Mean	......	......	......	......	......	......	......	......	396	483	1,882	558
1901.												
1	400	600	600	3,536	4,650	2,060	280	880	600	310	170	320
2	400	600	600	3,624	4,320	1,660	270	880	620	290	170	380
3	400	600	600	3,305	3,740	2,150	410	450	570	310	360	400
4	400	600	600	2,307	3,000	1,470	310	390	520	290	290	340
5	400	600	600	2,449	900	2,400	300	450	470	290	420	320
6	490	600	600	2,202	830	3,480	600	500	440	270	430	320
7	490	600	600	1,426	640	3,040	540	540	280	330	460	320
8	490	600	600	1,140	550	2,280	510	760	260	300	430	290
9	460	600	610	1,332	500	830	480	1,040	340	300	410	290
10	460	600	620	1,404	640	900	410	1,510	170	220	330	700
11	420	600	610	1,633	1,700	740	380	510	170	250	360	1,360
12	420	600	600	1,449	2,450	590	510	700	250	250	430	1,260
13	420	600	560	1,197	2,060	570	460	670	640	370	520	1,160
14	420	600	540	2,191	1,200	450	300	620	540	1,320	1,330	760
15	420	600	640	2,191	900	300	190	510	460	850	1,330	34,350
16	440	600	1,306	1,967	720	300	170	470	800	800	1,400	8,490
17	440	600	921	1,463	1,200	280	160	440	640	720	1,280	7,940
18	420	600	950	1,376	1,430	280	640	440	510	580	1,260	5,710
19	420	600	806	2,123	1,200	300	540	330	530	550	500	5,580
20	600	600	836	2,232	1,280	1,200	390	220	740	520	410	5,190
21	600	600	883	2,965	1,370	760	330	260	620	470	440	5,190
22	600	600	939	2,608	1,260	900	180	260	450	460	360	2,103
23	600	600	1,383	2,436	1,260	1,660	200	220	400	410	340	1,318
24	600	600	1,512	2,668	760	900	190	260	280	470	320	1,183
25	600	600	2,795	2,475	580	540	230	460	230	480	350	1,010
26	600	600	3,275	2,673	560	410	290	330	260	460	360	1,010
27	600	600	2,736	2,700	560	330	430	300	300	270	480	1,010
28	600	600	4,785	9,116	640	290	600	190	280	270	380	1,010
29	600	......	3,698	8,060	1,200	270	1,160	190	290	250	330	1,010
30	600	......	3,366	4,692	1,300	300	1,430	150	280	270	300	1,010
31	600	......	4,492	......	1,300	......	740	180	......	180	......	1,010
Mean	497	600	1,408	2,698	1,441	1,054	439	487	431	422	531	2,976

Mean Daily Discharge, Second-feet, of West Canada Creek at Twin Rock Bridge, N. Y.—
(Continued).

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
1	560	520	3,839	3,665	4,198	1,126	1,911	668	370	1,241	1,911	700
2	560	520	6,260	2,711	2,763	1,087	2,151	635	330	542	1,202	684
3	560	560	7,488	1,959	1,863	1,010	3,839	635	280	542	1,280	1,521
4	560	560	5,710	1,318	1,959	2,295	6,612	586	255	465	602	3,433
5	560	560	4,441	1,337	2,295	1,521	3,319	502	330	490	635	2,711
6	560	560	3,095	1,241	1,521	968	2,399	845	415	478	885	2,659
7	560	560	2,555	1,280	1,605	1,356	1,437	1,395	415	478	1,202	3,433
8	560	560	2,103	1,298	1,241	1,087	1,437	1,260	602	1,815	1,048	968
9	560	560	2,199	4,501	1.087	770	1,337	1,563	845	2,103	925	770
10	560	560	1,911	4,258	1,087	1,087	1,280	1,521	770	1,563	735	788
11	560	560	1,887	2,451	885	1,935	1,087	1,318	668	718	635	740
12	560	560	2,295	2,223	770	845	651	1,959	392	570	735	740
13	560	560	4,076	2,247	602	1,356	515	1,318	370	515	1,815	640
14	560	560	6,330	2,451	502	1,202	490	968	440	502	2,007	550
15	560	560	4,016	1,605	370	1,773	845	770	381	465	1,164	600
16	560	520	4,813	1,395	370	1,731	2,815	602	330	478	1,087	820
17	560	520	8,410	1,479	440	1,395	1,318	570	330	370	1,280	2,700
18	560	*500	6,540	1,356	528	925	1,144	515	270	270	1,106	2,460
19	560	*440	6,901	1.280	528	718	925	668	225	1,202	808	1,220
20	560	*420	6,365	1,395	602	808	1,647	618	195	2,503	718	880
21	560	*410	2,295	1,202	586	845	2,955	700	240	3,095	770	720
22	520	*400	2,007	2,007	556	2,451	4,076	770	225	2,607	885	2,840
23	490	520	2,607	1,605	515	1,773	3,123	752	225	2,055	1,087	2,950
24	490	*420	2,503	1,395	1,563	1,318	1,773	618	225	2,031	602	2,180
25	520	*410	2,223	1,437	2,295	925	1,395	515	232	1,164	718	1,760
26	520	*440	2,031	1,280	2,031	2,199	770	428	262	1,395	635	1,230
27	520	*360	1,863	1,911	1,689	3,151	586	370	370	1,815	718	1,160
28	520	510	2,199	2,103	1,479	1,959	808	305	465	4,198	1,164	1,070
29	520	......	5,580	1,337	1,395	1,437	968	290	1,395	5,840	1,087	1,480
30	520	......	8,015	2,983	1,647	2,503	735	262	2,247	3,151	868	1,480
31	520	......	5,190	......	1,911	......	602	415	......	3,549	......	1,420
Mean	545	520	4,121	1.957	1,318	1,452	1,772	785	467	1,555	1,008	1,510
1903.												
1	1,070	2,370	6,000	4,702	1,468	210	885	700	602	370	905	160
2	1,120	2,570	3,960	3,334	1,741	182	1,826	635	490	465	845	184
3	1,420	1,700	1,480	3,820	700	195	1,546	392	465	570	770	244
4	2,250	1,070	1,880	8,440	602	173	1,162	542	1,280	635	684	184
5	1,940	1,210	1,420	4,110	515	182	905	2,616	465	845	770	206
6	2,100	970	840	3,010	465	173	1,314	2,344	415	515	905	342
7	1,760	970	840	2,198	542	270	808	2,175	290	1,010	845	308
8	1,760	1,480	1,220	4,400	542	232	885	1,468	173	1,815	826	316
9	1,160	1,760	2,970	3,469	465	210	925	1,086	173	7,648	700	299
10	1,160	1,820	3,560	4,430	515	225	490	1,124	173	16,100	668	316
11	1,160	2,000	4,840	3,820	490	218	255	1,741	280	5,980	668	316
12	1,160	2,060	6,540	2,794	515	1,873	232	6,092	1,126	4,380	700	285
13	1,320	2,370	3,700	2,641	370	2,902	232	3,280	370	2,295	700	351
14	1,370	2,370	3,700	2,443	202	1,488	262	1,585	370	2,055	635	351
15	1,320	1,650	1,370	3,064	202	2,294	262	1.448	370	1,815	635	395
16	1,220	1,760	3,880	2,740	270	1,124	392	1.162	350	1,087	651	465
17	1,220	970	3,540	9,198	370	1,488	232	1,048	210	1,356	1.029	299
18	1,220	1,220	3,500	2,740	651	668	262	718	925	5,320	2.103	368
19	920	1,270	4,600	1,162	770	1,048	262	370	635	4,319	1,605	508
20	880	760	5,900	2,492	370	542	415	1,048	465	2.347	1,479	257
21	920	700	8,480	815	270	1,780	240	1,124	490	1,911	1,356	611
22	1,220	560	9,640	1,780	248	5,801	845	1,010	668	1,521	1,126	704
23	1,260	800	10,810	556	290	3,110	2,767	752	465	1,318	1,048	746
24	1,060	1,070	12,940	668	370	2,106	3,280	570	360	1,318	546	536
25	970	600	7,700	668	225	3,118	1,966	1,048	415	1,280	299	724
26	920	400	4,720	1,546	218	2,592	1,010	4,255	330	1,280	160	465
27	840	480	3.000	580	240	2,100	3,280	2,443	350	1,010	206	324
28	840	1,320	2,500	808	225	2,443	1,507	1,780	370	885	270	359
29	880	......	2,960	900	232	968	602	968	415	845	270	584
30	1,640	......	2,790	668	225	845	1,238	946	370	845	206	809
31	2,050	......	2,700	......	248	......	668	602	......	788	......	831
Mean	1,294	1,367	4,321	2,534	470	1,352	999	1.518	462	2,386	787	415

* Doubtful.

Estimated Monthly Discharge of West Canada Creek at Twin Rock Bridge, N. Y.
[Drainage area 364 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1900.					
September	1,731	151	396	1.08	1.20
October	1,437	210	483	1.32	1.52
November	5,515	330	1,882	5.17	5.77
December	1,010	400	558	1.52	1.75
1901.					
January	600	400	497	1.36	1.57
February	600	600	600	1.65	1.72
March	4,785	540	1,408	3.87	4.46
April	9,116	1,140	2,698	7.42	8.28
May	4,650	500	1,441	3.96	4.57
June	3,480	270	1,054	2.90	3.24
July	1,430	160	439	1.21	1.39
August	1,510	150	487	1.34	1.54
September	740	170	431	1.18	1.32
October	1,320	180	422	1.16	1.34
November	1,400	170	531	1.46	1.63
December	34,350	290	2,976	8.19	9.44
1902.					
January	560	490	545	1.49	1.72
February	560	360	520	1.43	1.48
March	8,410	1,863	4,121	11.33	13.06
April	3,665	1,202	1,957	5.39	6.01
May	4,198	370	1,318	3.63	4.18
June	3,151	718	1,452	3.98	4.44
July	6,612	490	1,772	4.86	5.60
August	1,959	290	785	2.16	2.49
September	2,247	195	467	1.28	1.43
October	5,840	270	1,555	4.29	4.94
November	2,007	602	1,008	2.77	3.09
December	3,433	550	1,510	4.15	4.78
1903.					
January	2,250	840	1,294	3.56	4.10
February	2,570	400	1,367	3.76	3.91
March	12,940	840	4,321	11.88	13.69
April	8,440	556	2,534	6.96	7.76
May	1,741	202	470	1.29	1.49
June	5,801	173	1,352	3.72	4.15
July	3,280	232	998	2.74	3.16
August	4,255	370	1,518	4.16	4.79
September	1,280	173	462	1.27	1.42
October	16,100	370	2,386	6.56	7.56
November	2,103	206	187	2.16	2.41
December	809	160	415	1.14	1.31

STARCH FACTORY CREEK NEAR NEW HARTFORD, HERKIMER COUNTY, N. Y.

A gauging weir was erected on this stream above the head of the former Savage Reservoir, May 26, 1903. The stream flows in a gulf 300 feet below the general plateau. A rainfall record has been kept for several years, using a 3-inch gauge placed near ground on the sodded slope at left-hand side of the stream. A standard 10-inch gauge 4 feet above the ground was erected at some distance from trees or structures, September 11, 1903, and parallel observations of the two gauges have been made. The gauges have been observed by G. H. Savage, and the records furnished by the Consolidated Water Company, by whom the weir was erected. The weir has a horizontal iron crest 6 feet in length with end contractions. The weir gauge is placed 6 feet upstream from the weir and is observed twice daily. The discharge is calculated by the Francis formula. In extreme freshets, the discharge is observed at a masonry intake dam a short distance downstream. The approximate high water discharge has been as follows:

DATE.	Second-feet.	Second-feet, square mile.
March, 1903	367	108
October 10, 1903	313	92

The drainage basin of Starch Factory Creek includes Graefenberg Creek and Reservoir as elsewhere described. Graefenberg Reservoir has a capacity of 20,000,000 gallons, and water is diverted therefrom through a 12-inch conduit.

The region tributary to Starch Factory Creek consists of cleared farm land, chiefly sodded slopes rising from the stream to the divide on either side, a height of 300 to 400 feet, in a distance of about one mile from the main stream. A limited number of lateral tributaries drain the more remote portions of the area. The stream is tributary to Mohawk River near Utica, N. Y. The drainage basin is shown on the Utica quadrangle, No. 128 U. S. Geol. Survey Topographic map, from which the following drainage areas have been taken:

Drainage Areas Starch Factory Creek.

	Square miles.
Above Graefenberg Reservoir Dam *a*	.45
Above gauging weir	3.40
Above Savage Reservoir Dam	3.81
Above mouth	6.60

a Topographic area above Graefenberg Reservoir Dam. The yield is developed from this area by tiling from springs.

Mean Daily Discharge, Second-feet, of Starch Factory Creek near New Hartford, N. Y.[a]

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	.41	8.29	1.00	4.55	.74	2.89	1.22
2	......	......	......	......	......	.41	2.64	.95	2.89	1.47	2.17	1.10
3	......	......	......	......	......	.41	1.59	.89	2.48	.79	1.16	1.10
4	......	......	......	......	......	.41	1.47	12.50	1.84	.79	1.10	1.10
5	......	......	......	......	......	.41	4.57	7.61	1.47	13.62	1.34	1.10
6	......	......	......	......	......	.41	4.05	4.27	1.34	1.96	1.40	1.10
7	......	......	......	......	......	.48	1.78	3.82	1.10	1.40	1.40	1.10
8	......	......	......	......	......	2.21	1.34	1.78	1.00	39.60	1.40	1.10
9	......	......	......	......	......	.72	1.10	19.76	.95	87.00	1.22	1.10
10	......	......	......	......	......	.72	.89	4.25	1.00	39.00	1.22	1.41
11	......	......	......	......	......	.57	.84	27.20	1.59	9.34	1.22	1.28
12	......	......	......	......	......	14.34	.84	6.43	1.05	5.24	1.22	1.60
13	......	......	......	......	......	2.99	.84	2.88	1.00	4.36	1.16	2.88
14	......	......	......	......	......	1.21	2.93	1.84	.89	3.21	1.10	4.65
15	......	......	......	......	......	4.88	1.10	1.34	.89	2.64	1.10	2.80
16	......	......	......	......	......	6.98	3.42	1.00	.79	2.34	2.62	2.34
17	......	......	......	......	......	11.30	1.16	1.00	3.08	3.30	13.83	2.09
18	......	......	......	......	......	6.05	.84	1.00	1.34	11.59	4.56	1.96
19	......	......	......	......	......	3.64	1.40	.95	.94	5.92	2.80	1.72
20	......	......	......	......	......	2.21	1.34	4.55	.79	5.73	2.64	3.50
21	......	......	......	......	......	45.25	4.17	1.65	.79	4.74	2.34	10.75
22	......	......	......	......	......	9.62	2.15	1.10	.79	3.90	2.22	6.02
23	......	......	......	......	......	9.55	3.04	1.00	.79	3.56	2.15	4.56
24	......	......	......	......	......	8.31	2.97	.89	.68	2.64	3.29	3.82
25	......	......	......	......	......	11.50	1.47	38.50	.63	3.64	2.80	7.47
26	......	......	......	......	.45	6.16	1.40	5.63	.68	3.46	2.42	3.72
27	......	......	......	......	.48	3.13	1.00	3.04	1.08	3.12	1.96	3.30
28	......	......	......	......	.56	2.15	.89	2.09	.79	3.29	1.96	2.72
29	......	......	......	......	.48	1.72	2.19	17.50	.68	3.29	1.66	2.22
30	......	......	......	......	.48	5.49	1.40	6.84	.68	3.29	1.34	1.96
31	......	......	......	......	.48	......	1.22	10.57	......	3.38	......	1.72
Mean	......	......	......	......	.48	5.45	2.08	6.25	1.29	8.98	2.32	2.73

Estimated Monthly Discharge of Starch Factory Creek near New Hartford, N. Y.

[Drainage area, 3.40 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			Second-feet.	CORRECTED RUN-OFF.		Rainfall, inches.
	Maximum.[b]	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.	
1903.							
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May 26-31	.61	.45	.48	1.25	.368	.43	....
June	62.00	.37	5.45	6.22	1.829	2.04	8.49
July	11.55	.84	2.08	2.85	.838	.97	4.92
August	52.00	.84	6.25	7.02	2.064	2.37	5.90
September	5.48	.63	1.29	2.06	.606	.68	1.12
October	87.00	.74	8.98	9.75	2.866	3.31	7.40
November	17.31	1.05	2.32	3.09	.908	1.01	2.09
December	12.30	1.05	2.73	3.50	1.029	1.19	2.54

The following table gives the figures of normal or average monthly precipitation from the beginning of the record and including 1899, together with the total precipitation by months for

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[a] Maximum discharge approximate.

[b] Maximum approximate.

the years 1895, 1896, 1897, and 1898, and also the annual totals. In obtaining the normal precipitation the average is taken for all of the months during which observations were made.

Precipitation at Savage (No. 8 Reservoir), near Utica, N. Y. a

YEAR.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1880	3.60	1.90	1.62	1.33	4.54	2.51	3.80	5.27	4.11	5.89	3.54	1.06	39.17
1881	1.90	2.67	2.08	0.60	3.69	2.59	3.83	1.56	2.51	6.67	4.22	8.72	41.04
1882	2.63	2.04	4.78	1.39	5.12	7.52	3.62	1.62	3.22	1.25	2.28	3.38	38.85
1883	1.85	3.03	0.66	0.71	4.26	5.38	5.10	1.21	4.16	3.61	3.89	2.42	36.28
1884	2.90	4.84	4.02	1.31	4.95	1.13	2.84	3.38	2.62	4.28	2.86	5.06	40.18
1885	2.32	2.26	0.76	1.92	4.26	3.09	6.68	7.04	2.14	7.95	4.99	3.76	47.19
1886	2.42	1.33	3.36	3.06	2.63	3.41	6.37	2.51	5.98	3.69	7.10	1.72	43.55
1887	4.65	7.04	2.76	2.49	2.28	2.06	4.05	3.68	2.50	1.96	4.05	4.06	41.18
1888	3.35	2.98	4.62	2.87	4.09	4.55	1.56	3.85	3.62	5.52	4.90	3.12	45.09
1889	4.32	4.04	3.25	2.71	2.49	9.19	5.49	1.72	3.93	3.91	3.83	3.31	48.13
1890	4.96	4.82	3.81	3.30	8.72	4.76	3.25	5.18	7.40	6.65	6.37	4.79	64.01
1891	4.68	3.20	3.40	1.87	1.69	2.91	3.27	3.55	2.51	2.92	3.94	6.40	40.34
1892	6.57	4.38	9.86	1.09	6.49	4.73	6.76	9.29	3.12	3.03	4.11	1.90	61.33
1893	2.03	8.32	2.45	2.74	7.84	1.53	4.25	8.50	3.95	1.65	2.42	4.40	49.63
1894	2.21	4.17	3.10	2.48	5.89	3.95	3.69	3.68	4.70	5.46	2.73	2.82	44.88
1895	4.89	3.13	1.20	2.81	3.17	2.07	4.37	5.31	3.48	0.62	4.83	5.09	40.97
1896	1.40	6.28	6.61	0.08	2.62	4.87	5.74	1.95	3.48	3.42	4.54	2.66	43.65
1897	2.71	1.73	4.24	3.37	4.97	5.14	6.01	4.70	3.52	0.87	7.19	3.80	48.25
1898	5.65	2.45	2.38	4.37	5.73	3.59	2.24	9.51	3.67	4.68	4.29	2.25	50.81
1899	1.83	2.42	4.08	2.06	3.97	2.32	4.30	3.30	2.51	2.93	2.51	3.88	36.11
1900	4.33	5.40	5.75	1.72	1.62	3.48	6.04	3.02	1.61	3.51	6.24	4.53	47.25
1901	2.72	0.95	3.43	4.92	5.45	5.43	4.89	2.84	2.28	3.29	4.66	5.99	46.85
1902	1.26	4.92	3.52	1.92	5.12	6.35	8.89	3.38	4.79	5.68	2.49	4.50	52.82
1903	3.41	3.72	6.83	2.11	0.28	9.75	5.13	5.87	1.43	7.38	2.31	2.66	51.08
Mean ..	......	......	......	......	......	......	......	......	......	......	......	......	45.80

Daily Precipitation at Savage Reservoir near Utica, N. Y. b

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	......	.24	......	......	.13	......	......
2	......	......	......	......	......	......	......	......	......	.20	......	......
3	......	......	......	.18	......	......	.02	......	......	......	......	......
4	.61	......	......	.39	......	......	......	1.03	......	......	......	......
5	......	......	.41	......	......	......	.58	.29	......	1.05	.51	......
6	......	......	......	......	.03	......	.19	.20	......	......	.18	......
7	......	......	......	.48	.15	......	......	.21	......	.02	......	......
8	......	......	......	.30	......	.47	......	......	......	1.50	......	.13
9	......	......	.92	.02	......	......	......	.68	......	2.00	......	......
10	......	1.40	.11	.27	......	.26	......	......	......	.95	......	1.20
11	......	......	.96	......	......	.23	......	.34	.32	......	......	......
12	1.04	......	......	......	......	3.04	......	......	......	......	......	......
13	.22	......	......	......	......	......	......	......	......	......	......	.28
14	......	......	......	......	......	.38	.85	......	......	......	......	.05
15	......	......	......	.28	......	.27	......	......	......	......	......	.06
16	......	.71	......	......	......	.44	.37	......	......	......	......	......
17	.17	.66	.21	.16	......	.62	......	......	.64	......	.90	......
18	......	......	......	......	......	.15	......	......	.10	.89	.14	.05
19	......	......	......	......	......	......	.28	......	......	.11	.08	......
20	......	......	......	......	......	.10	.20	.76	......	......	......	......
21	......	......	.60	......	......	2.08	.51	......	......	......	......	.51
22	.90	......	.66	......	......	......	.21	......	......	......	......	......
23	......	......	.46	.02	......	.31	.52	......	......	.21	......	.08
24	......	.78	.88	......	......	.11	......	......	......	......	.41	......
25	......	......	.90	.01	......	.57	......	1.16	......	......	......	.09
26	.27	......	.73	......	......	......	.51	.29	.23	......	.09	.04
27	......	......	.50	......	......	......	......	......	.14	......	......	.06
28	.13	.17	.21	......	.10	......	......	......	......	.32	......	......
29	......	......	.22	......	......	.19	.47	.49	......	......	......	......
30	......	......	......	......	......	.53	.18	.18	......	......	......	......
31	.07	......	.86	......	......	......	......	.24	......	......	......	.12
Total........	3.41	3.72	6.83	2.11	.28	9.75	5.13	5.87	1.43	7.38	2.31	2.66

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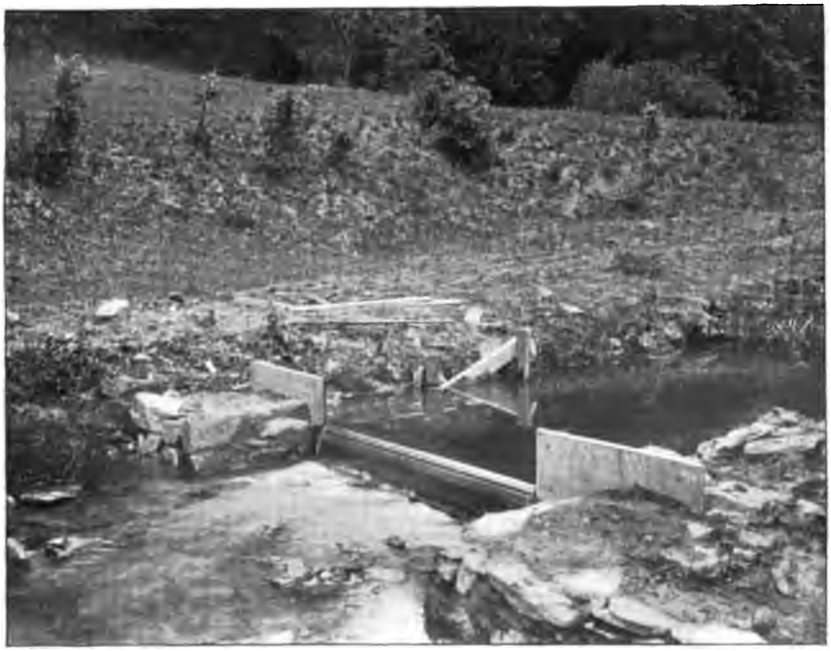
a Four-inch gauge standing on ground on south slope Mohawk Valley at elevation about 700 feet above tide.

b No. 1 or small rain gauge except December.



Starch Factory Creek: Wier near New Hartford, Herkimer County, N. Y.

GRAEFENBERG CREEK NEAR NEW HARTFORD, HERKIMER COUNTY, N. Y.

A gauging weir was erected above the inflow to Graefenberg Reservoir, June 7, 1903, and a standard rain gauge was placed on the adjoining meadow slope some distance from trees and structures. This small catchment basin, having a topographic area, 0.282 square mile in extent, is cleared farm land, chiefly meadow and pasture.[a] It lies between elevations 1,100 and 1,300 feet above tide, and near the summit of the general plateau south of Mohawk River. The soil is porous and the stream is fed largely from the ground water reserve.[b] The weir is compound in form, five feet crest length with two end contractions and a central notch two feet long .21 foot deeper.

The discharge is calculated by the Francis formula. The gauges are read by R. O. Salisbury and the record furnished by the Consolidated Water Company of Utica, N. Y.

Mean Daily Discharge, Second-Feet, of Graefenberg Creek at New Hartford, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	......	1.55	.85	.95	.75	.90	.78
2	......	......	......	......	......	......	.95	.80	.91	.89	.85	.78
3	......	......	......	......	......	......	.91	.78	.88	.72	.85	.78
4	......	......	......	......	......	......	.91	2.52	.85	.72	.85	.78
5	......	......	......	......	......	......	1.10	1.19	.81	2.70	1.34	.80
6	......	......	......	......	......	......	1.10	.95	.81	.84	1.00	.80
7	......	......	......	......	......	c .62	.91	.88	.78	.78	.91	.81
8	......	......	......	......	......	c .62	.91	.85	.78	5.19	.88	.80
9	......	......	......	......	......	c .62	.88	2.32	.78	15.15	.85	.78
10	......	......	......	......	......	c .62	.85	1.00	.78	4.02	.85	.88
11	......	......	......	......	......	c .65	.85	1.78	.81	1.49	.85	.83
12	......	......	......	......	......	1.55	.85	1.05	.78	1.20	.85	.86
13	......	......	......	......	......	1.00	.85	.88	.78	1.05	.83	1.65
14	......	......	......	......	......	.80	.88	.88	.78	1.00	.85	1.05
15	......	......	......	......	......	.85	.85	.81	.75	.96	.81	1.00
16	......	......	......	......	......	1.05	.88	.81	.72	.91	.85	.98
17	......	......	......	......	......	1.52	.85	.78	.81	.91	1.97	.91
18	......	......	......	......	......	.95	.85	.78	.81	9.34	1.10	.85
19	......	......	......	......	......	.82	.85	.94	.75	9.74	.96	.85
20	......	......	......	......	......	.78	.82	1.05	.72	1.14	.91	2.20
21	......	......	......	......	......	3.45	1.14	.88	.72	1.00	.91	1.67
22	......	......	......	......	......	1.15	.96	.78	.72	.96	.91	1.24
23	......	......	......	......	......	1.26	1.40	.78	.72	1.00	.96	1.05
24	......	......	......	......	......	1.15	1.00	.78	.72	.91	1.08	1.05
25	......	......	......	......	......	1.62	.88	3.50	.72	.91	.96	1.28
26	......	......	......	......	......	1.09	.88	1.05	.72	.91	.91	1.08
27	......	......	......	......	......	.95	.85	.91	.73	.91	.91	.98
28	......	......	......	......	......	.91	.78	.91	.72	.96	.85	.91
29	......	......	......	......	......	.91	.88	1.88	.72	.96	.82	.88
30	......	......	......	......	......	1.20	.90	1.05	.72	.91	.78	.86
31	......	......	......	......	......	......	.85	1.35	......	.91	......	.85
Mean	......	......	......	......	......	1.09	.94	1.15	.78	2.25	.945	1.00

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[a] Yield from this area developed by tiling from springs in surrounding slopes.

[b] Other nearby stream channels having tributary areas of equal or larger extent run dry in summer.

[c] Clearing intake, conditions artificial.

Precipitation at Graefenberg Reservoir near Utica, N. Y., in inches for 1903.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	......	.62	T	T	T	......	......
2	......	......	......	......	......	......	T	......	T	.85	......	......
3	......	......	......	......	......	......	......	......	......	......	......	.08
4	......	......	......	......	......	......	T	T	......	......	......	......
5	......	......	......	......	......	......	......	1.27	......	1.20	.30	.02
6	......	......	......	......	......	......	.88	.07	T	.04	.27	T
7	......	......	......	......	......	......	......	.17	T	T	......	T
8	......	......	......	......	......	......	......	T	......	......	......	T
9	......	......	......	......	......	......	......	.02	T	2.24	......	.01
10	......	......	......	......	......	aT	......	.63	......	2.00	......	1.85
11	......	......	......	......	......	......	......	......	.27	......	......	T
12	......	......	......	......	......	1.44	T	.59	......	......	.04	......
13	......	......	......	......	......	1.43	......	.01	......	......	......	.20
14	......	......	......	......	......	.02	......	......	T	......	......	.05
15	......	......	......	......	......	.50	.57	......	......	T	.05	.05
16	......	......	......	......	......	T	.30	......	......	......	.05	.02
17	......	......	......	......	......	.49	......	......	......	......	.76	.03
18	......	......	......	......	......	.16	......	......	.58	.88	.33	.06
19	......	......	......	......	......	.21	.25	......	.01	.10	T	......
20	......	......	......	......	......	T	.08	.85	......	.11	T	.04
21	......	......	......	......	......	1.49	.30	......	......	......	......	.31
22	......	......	......	......	......	.27	.38	......	......	......	......	.04
23	......	......	......	......	......	......	.20	......	......	.05	T	.07
24	......	......	......	......	......	.42	.27	......	......	.03	.17	T
25	......	......	......	......	......	.24	......	1.17	......	......	.04	.05
26	......	......	......	......	......	.21	.17	.18	......	......	.02	.04
27	......	......	......	......	......	......	......	T	......	......	.02	.02
28	......	......	......	......	......	......	......	T	.21	.26	T	.07
29	......	......	......	......	......	T	T	.55	.15	......	......	......
30	......	......	......	......	......	.16	.54	.11	......	......	......	.03
31	......	......	......	......	......	......	.05	.19	......	......	......	T
Total	......	......	......	......	......	7.04	4.61	5.81	1.22	7.26	2.04	2.54

SYLVAN GLEN CREEK NEAR NEW HARTFORD, ONEIDA COUNTY, N. Y.

New Hartford or Sylvan Glen Creek is the inflowing stream tributary to the No. 4 Reservoir of the Utica Water Works. The stream consists of two main branches, the larger flowing in a deep cut wooded shale valley, the smaller draining a shallow ravine and a marshy divide. The flow of this stream became very small in May, 1900, and it may become dry at times. A weir was erected June 12, 1903, at the mouth of the stream, having a crest 8 feet long with end contractions and with a central low-water notch 2 inches deep and 2 feet long. A gauge scale was placed 6 feet upstream and discharge was calculated by the Francis formula. The weir was injured by a fall freshet, but has been replaced by the Consolidated Water Company by whom the record is furnished.

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a Beginning of record.

The drainage basin, which lies at elevation 700 to 1,500 feet above tide, is shown on the Utica and Oriskany sheets, Nos. 128 and 115, of the U. S. Geological Survey Topographic map. It comprises chiefly woodland and pasture with some tillage, 1.18 square miles in extent.

Mean Daily Discharge, Second-Feet, of Sylvan Glen Creek, New Hartford, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903												
1							2.56	7.36				
2							.64	4.93				
3							.37	2.93				
4							.25	2.93				
5							9.20	1.22				
6							1.43	.61				
7							.49	.75				
8							7.42	.40				
9							13.07	1.62				
10							8.80	.94				
11							4.93	1.54				
12						9.54	2.94	.99				
13						1.43	2.05	.59				
14						1.05	1.18	.42				
15						1.35	7.40	.25				
16						1.29	9.18	13.28				
17						4.74	18.28	6.24				
18						2.23	3.67	3.82				
19						1.32	10.11	3.82				
20						1.05	7.36	.69				
21						11.55	7.52	.30				
22						3.19	2.38	14.72				
23						2.25	2.10	11.97				
24						1.25	.82	4.93				
25						2.63	*a*	8.97				
26						2.17	7.49	.90				
27						.99	11.63	.38				
28						.61	7.36	.42				
29						.52	8.80	1.79				
30						1.72	4.44					
31							13.28					

Estimated Monthly Discharge of Sylvan Glen Creek near New Hartford, N. Y.

[Drainage area, 1.18 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January					
February					
March					
April					
May			Little.		
June 12-30	11.55	*b*	2.68	2.27	2.53
July			5.91	5.00	5.75
August			3.44	2.91	3.35
September					
October					
November					
December					

a No record.

b Flow preceding June 11 insignificant; mean for 30 days 1.70 C. F. S.=1.44 sec.-ft. per sq. mile or 1.70 inches.

REEL'S CREEK AND JOHNSTON BROOK NEAR DEERFIELD, ONEIDA COUNTY, N. Y.

A gauging record at the Water Works Intake Dam on Reel's Creek was begun January 1, 1901.[a] In order to secure a more accurate record during periods of diversion, a weir was constructed on the shale rock stream bed, just above the intake dam in 1903. A second weir was constructed on Johnston Brook, a tributary of Reel's Creek, which enters below the point of gauging the latter. The calculated flow and the precipitation observed from a standard rain gauge at Deerfield Reservoir are given below.

The drainage of Reel's Creek lies on the north slope of Mohawk River to which the stream is tributary. The tributaries are numerous and the valleys deep cut with gravel or sodded slopes favoring rapid discharge of storm waters.

Johnston Brook flows in a deep valley whose tributary area, lying mostly to the north of the stream, is drained by short parallel feeders that head well below the divide and are supplied to some extent from ground storage.

Drainage Areas of Reel's Creek.[b]

LOCATION.	SQUARE MILES.	
	Place to place.	Total.
Reel's Creek above weir	4.42	4.42
Reel's Creek above Johnston Brook	0.05	4.47
Johnston Brook above weir	0.78	0.78
Johnston Brook above mouth	0.01	0.79
Reel's Creek including Johnston Brook	0.79	5.26
Reel's Creek above mouth	4.14	9.4

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[a] See Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor, New York, for 1902, pp. 136-141.

[b] From Utica sheet, No. 128, U. S. G. S. Topographic map.

Precipitation, in inches, at Utica Reservoir near Deerfield, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1										.32		
2												
3	.58			.52								
4		1.00		.60				1.30		1.25		
5		.05	.15				.55	.05			.25	
6		.03								2.25		
7	.50		.08	.82				.32		1.00		
8	.10		.65			1.18				.50		
9			.50					1.52		1.20		
10		.10				.08						2.00
11	.50	.75	.75			1.30		.60			.07	
12	.08					2.00		.10				
13	.12					.10						.25
14				.05		.32	.22					.10
15	.05			.10							.25	.12
16				.15		1.25				.25	1.10	
17	.15	.25	.10			.23		.04	.75	1.00		
18		.04				.18	.13					
19										.04	.10	
20						1.00		.75				.55
21		.05	.50			1.18	.82					
22		.03			.08		.80				.10	.10
23		.05	1.72			.51	.14			1.00	.75	
24			.40							.08	.15	
25			.35			.65		1.75				.25
26												.15
27			.20									
28	.75	1.40	.45		.03				.22			.08
29	.10							.25				.02
30			.40			.74						
31			.50					.10		.12		
Total	2.93	3.75	6.75	2.24	.11	10.72	2.16	6.78	.97	9.01	2.77	3.57

Estimated Monthly Discharge of Reel's Creek near Deerfield, N. Y.[b]
[Drainage area, 4.42 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		Rainfall—inches.[c]
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1901.						
January	102.5	1.30	6.83	1.550	1.79	3.12
February 1 to 17	1.75	1.30	1.38	.313	.33	1.79
March	49.0	1.30	8.02	1.820	2.10	3.09
April	55.8	1.75	11.81	2.679	3.09	3.58
May	62.68	1.30	8.55	1.948	2.25	4.57
June, [a] 5 observations	209.1	1.75	70.15	....	....	5.78
July, [a] 4 observations	37.5	1.3	12.39	....	....	3.87
Aug., [a] 5 observations	132.4	4.5	44.04	....	....	2.68
Sept., [a] 4 observations	32.0	1.3	9.09	....	....	4.50
Oct., [a] 4 observations	15.3	1.3	4.91	....	....	2.85
Nov., [a] 5 observations	30.5	1.3	7.23	....	....	2.46
Dec., [a] 9 observations	124.5	1.3	16.46	....	....	4.82
1902.						
Jan., [a] 6 observations	5.0	1.3	2.48	....	....	1.06
Feb., [a] 5 observations	4.69	1.3	2.07	....	....	2.94
March, 16 observations	254.7	2.48	78.9	....	....	6.24
April, 12 observations	42.4	1.3	10.85	....	....	2.18
May 1 to 22	18.6	1.11	3.88	.881	1.01	3.98
June	103.0	1.1	13.1	2.974	3.42	6.95
July	206.7	.8	29.8	6.764	7.78	9.15
August	21.6	.4	2.6	.590	.68	4.67
September	71.2	.4	5.0	1.135	1.31	5.81
October	120.8	1.1	11.8	2.679	3.09	5.93
November	7.2	1.1	3.4	.772	.89	2.11
December	19.5	2.2	6.2	1.407	1.63	4.34
1903. [d]						
January	26.5	4.4	7.66	1.74	2.01	2.93
February	202.4	4.9	16.8	3.81	3.97	3.75
March	247.2	5.4	39.3	8.92	10.28	6.75
April	256.5	.9	23.7	.54	.60	2.24
May 16 to 31	.39	.35	.38	.09	.10	.11
June	295.8	.17	38.41	8.72	9.73	10.72
July	42.4	.31	3.72	.84	.97	2.16
August	21.6	.39	4.57	1.04	1.20	6.78
September	6.93	2.36	4.31	.98	1.09	.97
October	15.58	2.36	7.06	1.60	1.84	9.01
November	14.76	3.21	4.58	1.04	1.16	2.77
December	6.38	3.21	3.97	.90	1.04	[e] 3.57
The year	....	....	....	....	33.99	51.96

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[a] Weekly observations.

[b] Record roughly approximate to May, 1902; approximate, June, 1902, to August 22, 1903; thin-edged weir, two readings per day, beginning August 23, 1903.

[c] At Deerfield Reservoir.

[d] Record approximate, January 1 to August 22, 1903.

[e] 2.39 inches water carried forward December 31, 1903, as snow leaving net available rainfall of December 1.18 inches.

Gauging Weir on Reel's Creek, near Utica, Oneida County, N. Y., 1902.

Mean Daily Discharge, Second-feet, of Reel's Creek near Deerfield, N. Y. [a]

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	4.9	17.6	17.6	20.6	*	.31	35.0	.48	6.93	2.49	4.96	3.28
2	4.9	14.2	14.2	20.6	*	.31	3.12	.39	6.71	2.49	3.44	3.21
3	26.5	10.5	14.2	42.3	*	.31	2.48	.39	6.38	2.49	3.28	3.21
4	12.0	18.8	14.2	20.6	*	.31	2.48	.39	6.38	2.36	3.36	3.21
5	10.5	17.6	10.5	12.0	*	.31	2.17	5.4	6.38	6.71	11.16	3.21
6	7.8	17.6	10.5	9.0	*	.31	2.17	3.12	6.38	5.65	7.70	3.21
7	5.4	17.6	10.5	256.5	*	.31	1.88	5.4	5.86	3.69	4.12	3.21
8	5.4	14.2	247.2	87.	*	.31	1.62	3.12	5.65	8.15	4.12	3.21
9	4.9	10.5	87.0	30.6	*	.17	1.48	3.12	5.54	15.58	3.69	3.21
10	4.9	10.5	20.6	20.6	*	.31	1.36	5.4	5.34	9.75	3.52	3.36
11	4.4	7.8	120.8	20.6	*	.23	1.36	2.79	5.14	6.72	3.21	3.36
12	4.4	12.0	20.6	9.0	*	59.85	1.11	8.72	4.96	7.48	3.21	3.86
13	4.4	14.2	20.6	9.0	*	14.77	.88	3.8	4.76	6.17	3.21	4.57
14	4.4	10.5	20.6	5.4	*	3.12	.67	2.48	4.57	5.54	3.21	3.95
15	4.4	7.8	12.0	20.6	*	2.63	.48	1.36	4.38	5.24	3.95	3.52
16	4.4	6.6	12.0	30.6	.39	.98	.31	1.20	4.38	5.14	9.75	3.21
17	4.4	6.6	20.6	12.0	.39	87.0	.31	.88	4.04	5.86	14.76	3.21
18	4.4	5.4	12.0	9.0	.39	3.8	.31	.88	3.78	8.83	4.96	3.21
19	4.4	5.4	9.0	5.4	.39	12.7	.31	.88	3.52	8.60	3.44	3.21
20	4.4	5.4	5.4	5.4	.39	2.96	.31	3.12	3.14	8.60	3.36	5.14
21	10.5	5.4	5.4	4.3	.39	295.8	2.03	1.36	2.75	8.60	3.36	5.76
22	7.8	5.4	72.0	4.3	.39	209.1	42.4	1.36	2.36	8.60	3.36	5.14
23	6.6	5.4	121.7	2.2	.39	209.1	2.48	3.14	2.36	8.15	3.36	4.66
24	6.6	5.4	71.2	1.8	.39	161.0	1.36	2.82	2.36	9.40	3.36	6.38
25	5.4	5.4	30.6	1.8	.39	62.0	.48	*b*	2.36	8.94	3.36	5.34
26	5.4	5.4	20.6	1.5	.39	7.2	2.17	18.3	2.36	8.60	4.04	4.96
27	5.4	4.9	35.2	1.1	.39	5.4	1.36	11.35	2.62	8.26	3.86	4.96
28	5.4	202.4	68.6	.9	.35	4.4	.39	7.48	2.62	8.04	3.52	4.76
29	20.6	......	33.7	*	.35	3.9	88	21.6	2.62	7.82	3.36	4.38
30	20.6	......	20.6	*	.35	3.4	1.36	8.15	2.62	7.48	3.36	4.20
31	12.0	......	39.8	*	.35	......	.57	8.15	......	7.48	......	3.36
Mean	7.66	16.8	39.3	23.7	.38	38.41	3.72	4.57	4.31	7.06	4.58	3.97

a Record approximate January 1 to August 22, 1903, inclusive.
b Above weir.
* No record.

Mean Daily Discharge, Second-feet, of Johnston Brook, at Deerfield, N. Y.

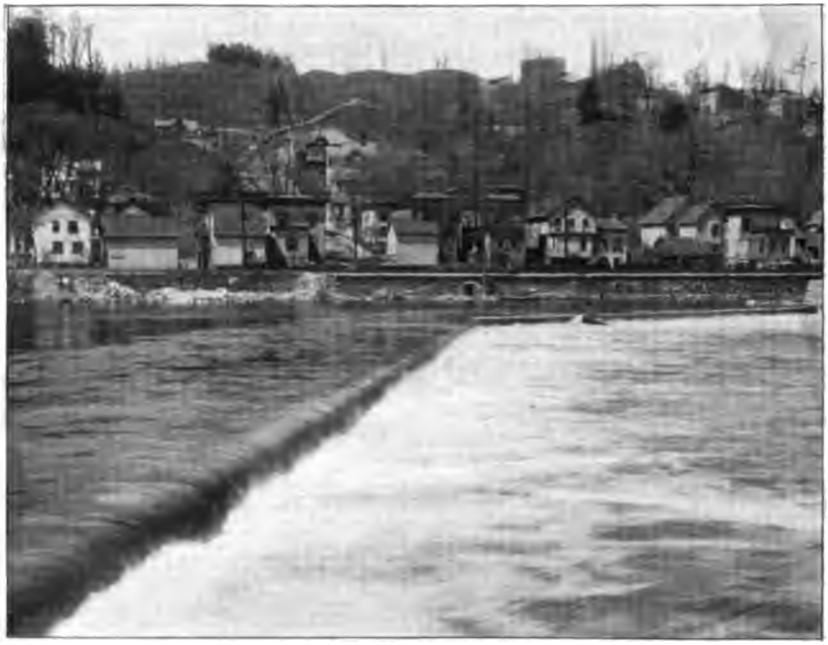
DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1									1.05	.22	.28	.26
2									.78	.22	.28	.25
3									.60	.20	.34	.25
4									.60	.18	.34	.25
5									.60	.78	.98	.25
6									*a*	.42	.88	.25
7										.26	.42	.30
8										5.54	.40	.25
9										8.22	.34	.25
10										4.20	.32	.25
11										1.68	.31	.25
12										1.05	.31	.25
13									.18	.92	.31	.47
14									.18	.74	.31	.32
15									.18	.64	.31	.25
16									.18	.60	.54	.25
17									.18	.92	4.97	.25
18									.30	1.51	1.57	.25
19									.25	1.28	.34	.25
20									.17	.92	.34	1.38
21									.16	.78	.32	1.36
22									.16	.69	.31	.74
23									.16	.57	.31	.50
24									.16	.47	.31	.52
25									.16	.44	.32	1.06
26									.16	.40	.34	.69
27									.31	.32	.34	.50
28								1.39	.31	.30	.34	.50
29								5.14	.31	.28	.31	.40
30								.60	.31	.28	.31	.40
31								1.30		.28		.42
Mean								2.11	.32	1.14	.57	.44

a No record September 6 to 12, inclusive.

Estimated Monthly Discharge of Johnston Brook, at Deerfield, N. Y.

[Drainage area, 0.79 square mile.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January					
February					
March					
April					
May					
June					
July					
August 28-31	5.14	.60	2.11		
September	1.05	.16	.32	.41	.46
October	8.22	.18	1.14	1.46	1.68
November	4.97	.28	.57	.73	.81
December	1.38	.25	.44	.56	.65



Mohawk River: New York State Dam at Little Falls, Herkimer County, N. Y.

MOHAWK RIVER AT UTICA, ONEIDA COUNTY, N. Y.

The accompanying table shows the mean daily discharge of Mohawk River at Utica, estimated from observations at Genesee Street Bridge, Utica, N. Y. The estimation of discharge was discontinued May 1, 1903, owing to changes in the river channel due to rectification of the portion lying adjacent to Utica, where work is now in progress.[a]

The drainage area of Mohawk River above Rome is exceptionally rugged and precipitous. There are, however, sand areas in the region of the headwaters which feed the stream in summer from ground storage. From Rome to Little Falls, a distance of thirty-six miles, the stream flows through a broad, flat valley, overflowing its banks during freshets, and passing over a rock barrier with 40 feet fall at Little Falls.

The stream receives inversion from Black River drainage basin through Black River Canal at Rome and from Chenango River Drainage Basin through Oriskany Creek at Oriskany. There is also diversion to supply the Erie Canal at Rome and Oriskany, and wastage from the canal is returned to the river at intermediate waste-weirs and aqueducts; so that the recorded discharge at Utica does not represent the natural regimen of the stream during the navigation season.

Discharge Measurements of Mohawk River, at Genesee Street, Utica, N. Y.

DATE.	Hydrographer.	Gauge height feet.	Discharge second-feet.
1903			[b]
Feb. 3	C. C. Covert,	7.35	3,196
March 2	C. C. Covert..	9.00	5,354
March 10	C. C. Covert.	9.135	5,930

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[a] The drainage basin of Mohawk River is shown in part on the Utica, Oriskany, Oneida and Boonville sheets Nos. 128, 115, 103 and 114 of the U. S. Geological Survey Topographic map.

[b] Snow and ice along banks of stream. River frozen across 400 feet above bridge.

Daily Discharge, Second-feet, of Mohawk River, at Genesee Street, Utica, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	445	4,160	10,720	3,025	......	......	......	......	......	......	......	......
2	729	3,788	5,205	2,520	......	......	......	......	......	......	......	......
3	930	3,238	4,048	1,670	......	......	......	......	......	......	......	......
4	2,260	3,504	3,276	2,200	......	......	......	......	......	......	......	......
5	2,380	4,160	2,885	2,560	......	......	......	......	......	......	......	......
6	1,828	3,996	2,742	1,900	......	......	......	......	......	......	......	......
7	1,140	3,130	2,688	1,294	......	......	......	......	......	......	......	......
8	1,020	2,500	3,736	2,796	......	......	......	......	......	......	......	......
9	729	1,390	......	3,095	......	......	......	......	......	......	......	......
10	701	1,326	5,210	2,661	......	......	......	......	......	......	......	......
11	......	1,294	7,300	2,607	......	......	......	......	......	......	......	......
12	813	2,085	6,700	1,140	......	......	......	......	......	......	......	......
13	785	2,885	4,048	......	......	......	......	......	......	......	......	......
14	757	3,095	3,406	975	......	......	......	......	......	......	......	......
15	757	2,400	3,025	1,170	......	......	......	......	......	......	......	......
16	701	1,740	2,990	1,232	......	......	......	......	......	......	......	......
17	673	1,140	2,850	1,186	......	......	......	......	......	......	......	......
18	......	900	2,920	1,110	......	......	......	......	......	......	......	......
19	645	900	2,885	......	......	......	......	......	......	......	......	......
20	562	945	2,920	841	......	......	......	......	......	......	......	......
21	645	870	2,823	757	......	......	......	......	......	......	......	......
22	990	......	2,796	799	......	......	......	......	......	......	......	......
23	990	870	3,238	575	......	......	......	......	......	......	......	......
24	785	930	5,895	445	......	......	......	......	......	......	......	......
25	701	900	3,632	458	......	......	......	......	......	......	......	......
26	701	729	3,130	673	......	......	......	......	......	......	......	......
27	......	......	2,560	589	......	......	......	......	......	......	......	......
28	617	2,200	2,200	445	......	......	......	......	......	......	......	......
29	813	......	2,320	382	......	......	......	......	......	......	......	......
30	2,990	......	1,810	308	......	......	......	......	......	......	......	......
31	3,736	......	2,290	......	......	......	......	......	......	......	......	......

NINE MILE CREEK AT SOUTH TRENTON, ONEIDA COUNTY, N. Y.

The drainage basin of this stream is shown on the Utica, Remsen and Oriskany sheets, Nos. 128, 127 and 115, U. S. Geological map. Nine Mile Creek enters Mohawk River from the north, two miles west of Oriskany, N. Y. It is fed by numerous short lateral streams, flowing in parallel channels from the precipitous, serrated slopes bounding the drainage basin on both sides. The soil of the watershed is firm and impervious, underlaid by shale, which often appears at the surface in the stream channel.

	Sq. miles.
Above lower bridge at South Trenton	24.2
Above Powell's Mill	58.6
Above mouth	69.0

---

a From U. S. G. S. Topographic maps.

Cohoes Falls (70 feet), Mohawk River, N. Y., 1902.

The following measurements of discharge made by floats and current meter at the lower bridge in South Trenton, are published by courtesy of Wm. S. Bacot, C. E., of Utica, N. Y.

DATE.	VOLUME OF DISCHARGE.	
	Second-feet.	Second-feet per square mile.
1901.		
August 16	3.4	.1405
September 29	4.1	.1615

The precipitation at Deerfield Reservoir, five miles south of the point of gauging, was as follows, during the period immediately preceding the measurements:

September 10 to 17, 1901........................... 2.99 inches

No rainfall September 17 to September 29, 1901.

The measurement of August 16th was preceded by several falls of moderate precipitation at intervals of one or two days.

ORISKANY CREEK NEAR ORISKANY, ONEIDA COUNTY, N. Y.

A gauging station was established at Wood Road Bridge, one mile above Oriskany village, June 5, 1901. A vertical board scale is read twice daily by C. H. Smith.

Discharge measurements are made during low water only, by fording the stream a short distance below the bridge. In order to obtain measurements for a complete rating table, the erection of a cableway at some point farther upstream will be necessary.

The flow of Oriskany Creek is diverted, as a whole or in part, at the State Dam below the gauging station during the navigation season. This stream affords opportunity to determine the freshet discharge of the stream during the spring period from the time the ice goes out until the opening of the Erie Canal.

Oriskany Creek receives the inflow from storage reservoirs at the head of Chenango River. Gaugings of the diversion from these reservoirs to supply Erie Canal through Oriskany Creek, are described in connection with the records of Chenango River.

Discharge Measurements of Oriskany Creek at Wood Road Bridge near Oriskany, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1903.			
January 27	C. C. Covert	4.8	[a] 121
May 7	C. C. Covert	1.75	163
May 14	E. C. Murphy	1.725	158
May 21	W. Nunn	1.55	127
May 21	W. Nunn	1.55	118
July 9	H. H. Halsey	1.60	106

WEST BRANCH MOHAWK RIVER AT WEST BRANCH, ONEIDA COUNTY, N. Y.

This stream was gauged during the summer of 1901 at the upper bridge in West Branch Village near the extreme headwaters of Mohawk River. A vertical gauge scale was erected near the bridge, having its zero mark at elevation 92.52 referred to a bench mark on top of the right-hand bridge abutment downstream side, with elevation assumed 100.00. The stream height was observed each morning by Judson Daniels, from August 15 to December 14, 1901, inclusive, and the resulting record is shown in the accompanying table.

There is no artificial storage in the stream above the point of gauging, and the drainage basin contains numerous springs and sand areas. It is very rolling in topography. The drainage area above the point of gauging is approximately 16.3 square miles.[b]

The following current meter and float observations were made in connection with an investigation of proposed water supply for the cities of Rome and Utica. These, together with the gauge-height observations have been furnished for publication.

Discharge Measurements of West Branch Mohawk River.

DATE.	Gauge height, feet.	Discharge, second-feet.
1901.		
August 15	0.96	10.8
August 18	0.94	9.4
September 28	0.94	9.1
October 28	1.10	15.7
September 29, 1903	....	20.2

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[a] Measurement made under ice. Creek full of needle ice.
[b] From Bien's Atlas of New York.

The precipitation at Rome, an adjacent U. S. Weather Bureau Station, was, during the period of measurement, as follows:

Precipitation at Rome, Summer of 1901.

DATE.	Inches.	Date.	Inches.
August 11	.40	September 29 to 30	1.12
August 16	.60	October 3 to 4	.45
August 24	.35	October 6	.20
August 31	.28	October 10	.18
September 1 to 4	1.54	October 13 to 18	1.55
September 11 to 15	1.76	October 19 to November 7	Trace.
September 18	.20		

Mean Daily Gauge Height, feet, of West Branch Mohawk River, at West Branch, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	......	......	......	......	......	......	......	......	1.71	1.29	1.08	1.46
2	......	......	......	......	......	......	......	......	1.71	1.21	1.08	1.62
3	......	......	......	......	......	......	......	......	1.29	1.46	1.00	1.75
4	......	......	......	......	......	......	......	......	1.63	1.37	1.00	1.75
5	......	......	......	......	......	......	......	......	1.21	1.29	1.00	1.67
6	......	......	......	......	......	......	......	......	1.08	1.37	1.00	1.67
7	......	......	......	......	......	......	......	......	1.00	1.25	1.00	1.58
8	......	......	......	......	......	......	......	......	.96	1.21	1.00	1.58
9	......	......	......	......	......	......	......	......	.92	1.17	1.17	1.62
10	......	......	......	......	......	......	......	......	.92	1.29	1.17	3.50
11	......	......	......	......	......	......	......	......	.92	1.33	1.17	2.08
12	......	......	......	......	......	......	......	......	1.12	1.25	1.92	1.67
13	......	......	......	......	......	......	......	......	1.46	1.37	2.33	1.67
14	......	......	......	......	......	......	......	......	1.37	1.46	1.58	2.50
15	......	......	......	......	......	......	......	.96	2.12	1.63	1.50	......
16	......	......	......	......	......	......	......	1.04	1.71	1.46	1.42	......
17	......	......	......	......	......	......	......	1.00	1.29	1.42	1.42	......
18	......	......	......	......	......	......	......	.96	1.21	1.79	1.42	......
19	......	......	......	......	......	......	......	.92	1.17	1.75	1.33	......
20	......	......	......	......	......	......	......	.92	1.12	1.50	1.33	......
21	......	......	......	......	......	......	......	1.04	1.08	1.42	1.33	......
22	......	......	......	......	......	......	......	96	1.08	1.37	1.29	......
23	......	......	......	......	......	......	......	92	1.00	1.29	1.29	......
24	......	......	......	......	......	......	......	1.38	1.00	1.25	1.29	......
25	......	......	......	......	......	......	......	1.12	.96	1.17	2.12	......
26	......	......	......	......	......	......	......	1.00	.96	1.12	1.67	......
27	......	......	......	......	......	......	......	.96	.96	1.08	1.50	......
28	......	......	......	......	......	......	......	.92	.92	1.08	1.50	......
29	......	......	......	......	......	......	......	.92	1.21	1.08	1.50	......
30	......	......	......	......	......	......	......	.92	1.79	1.08	1.46	......
31	......	......	......	......	......	......	......	1.12	......	1.08	......	......

UPPER HUDSON RIVER DRAINAGE.[a]

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[a] Results of gaugings at the following named stations have been omitted from this report: See Reports of State Engineer as per footnotes on p. 104.
Hudson River at Fort Edward, N. Y.
Schroon River at Warrensburg, N. Y.

HUDSON RIVER AT MECHANICVILLE, SARATOGA COUNTY, N. Y.

A record of the flow of Hudson River at Mechanicville has been kept by the Duncan Company, beginning December, 1888. The record includes two daily readings of the depth on the crest of the dam, and a continuous record of the run of the water wheels in the adjoining paper mill. The accompanying tables show the monthly and daily mean flow at Mechanicville, computed by Mr. R. P. Bloss, the engineer of the company. A record is kept of the length and height of the flashboards at all times, with the dates of their setting and removal.

The flow over the dam has been computed by the Francis formula for the Merrimac dam:

$Q = 3.012\ L\ H^{1.53}$

L being 794 feet. H = depth on crest of dam in feet. The same formula has been used in all cases, whether flashboards are on or off.[a]

The water supply of Champlain Canal is drawn from Hudson River above Mechanicville; the gaugings at Mechanicville do not therefore represent precisely the natural yield of the drainage basin.

Measurements by means of rod floats in the Champlain canal level between locks Nos. 9 and 10, made under direction of Emil Kuichling in 1900 gave the following results:[b]

DATE.	Discharge, upper section.	Discharge, lower section.	Average discharge.
1900.			
October 10	136.68	125.90	131.29
October 11	132.79	144.80	138.79

The canal section is 17 miles in length and contains a number of waste weirs. It is located below the Saratoga Dam, at which point Champlain Canal crosses Hudson River in slackwater.[c]

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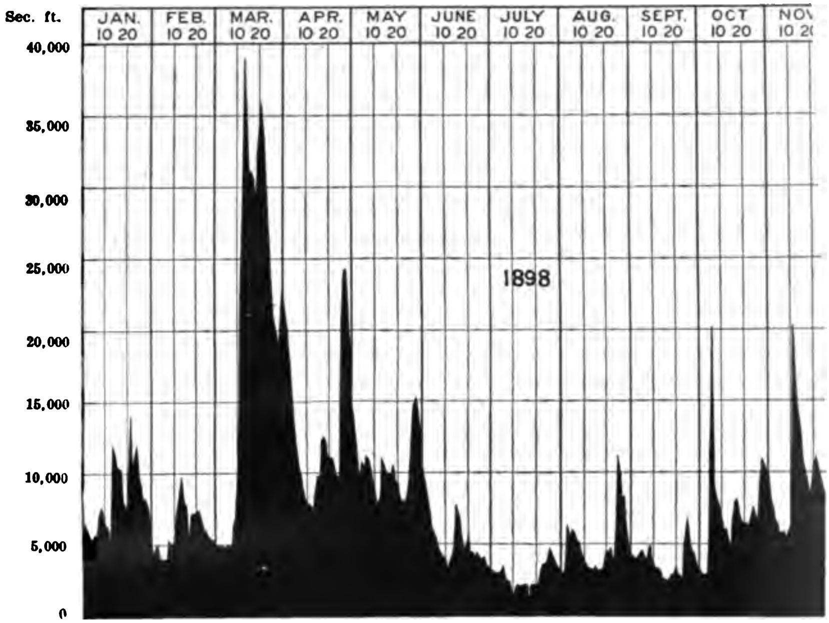
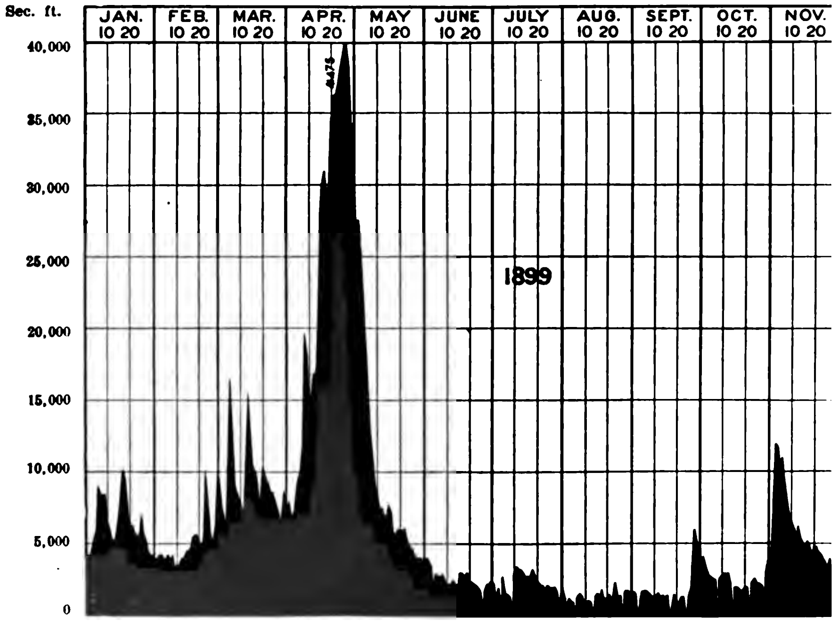
[a] For additional data and record of preceding years, see Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor of New York, for the year 1902, pp. 243-249.

[b] Report on Barge Canal, by Edward A. Bond, State Engineer and Surveyor, 1901, pp. 898-899.

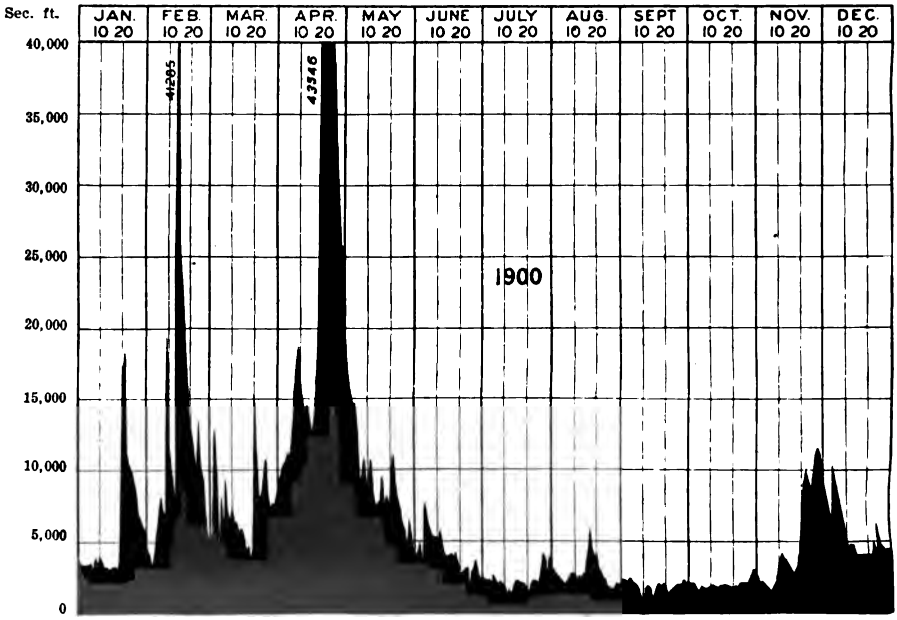
[c] Additional data relative to Hudson River drainage basin may be found in Reports on Upper Hudson Storage, by George W. Rafter, C. E., contained in the Annual Reports of the State Engineer and Surveyor for the years 1895 and 1896.



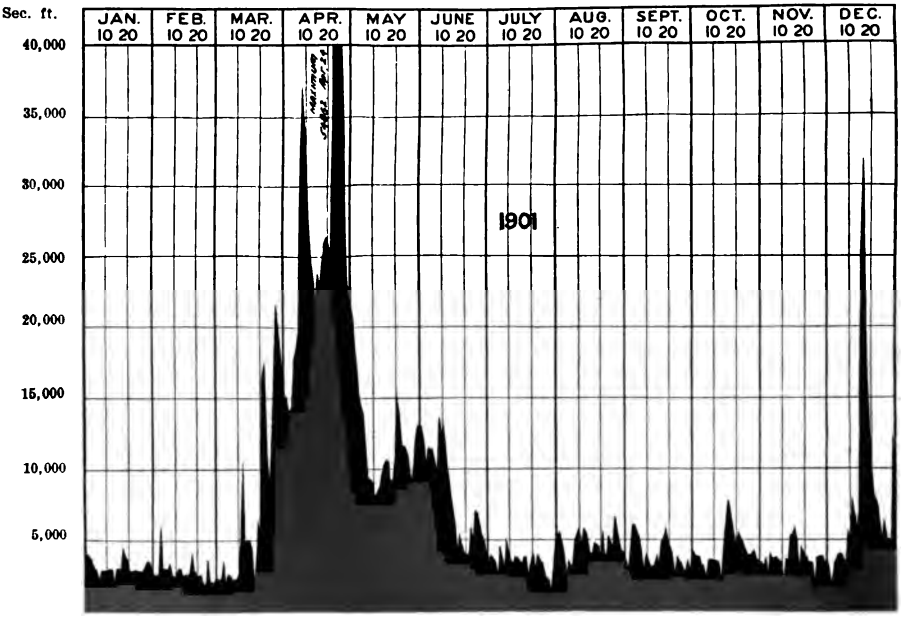
Discharge of Hudson River at Mechanicville, Saratoga County, N. Y., 1898.



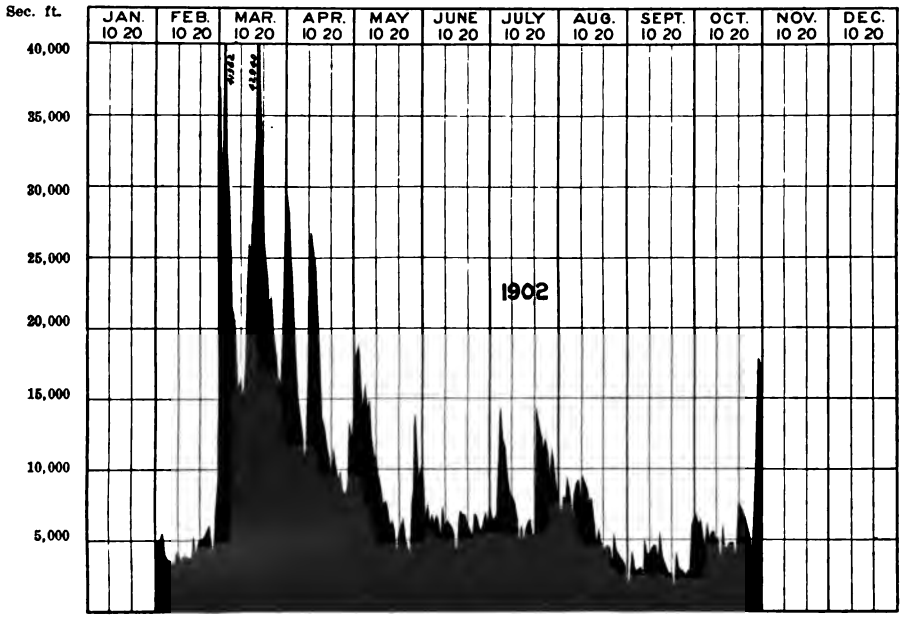
Discharge of Hudson River at Mechanicville, Saratoga County, N. Y., 1899



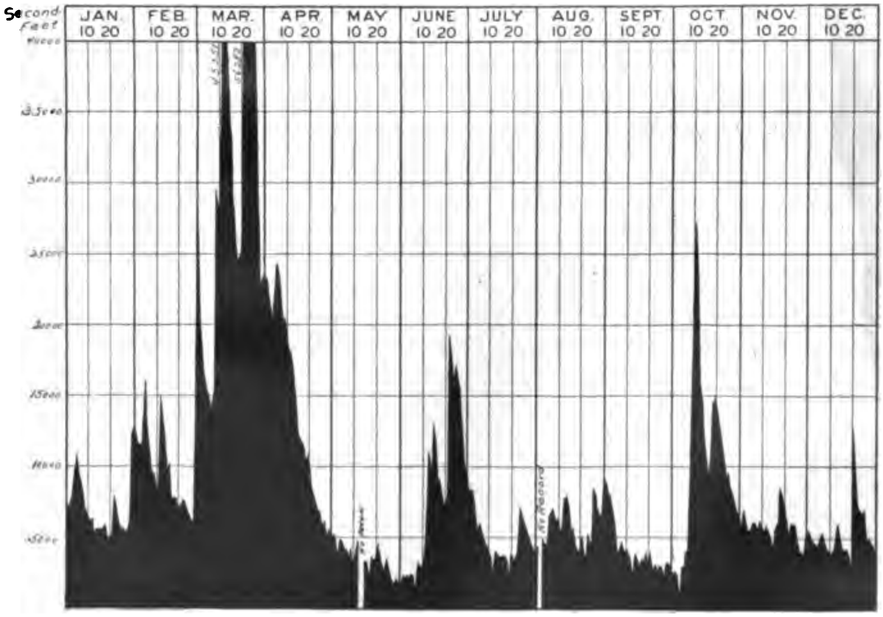
Discharge of Hudson River at Mechanicville, Saratoga County, N. Y., 1900.



Discharge of Hudson River at Mechanicville, Saratoga County, N. Y., 1901.



Discharge of Hudson River at Mechanicville, Saratoga County, N. Y., 1902.



Discharge of Hudson River at Mechanicville, Saratoga County, N. Y., 1903.

Mean Daily Discharge, Second-feet, of Hudson River at Mechanicville, N. Y.[b]

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	7,122	11,857	28,898	23,345	5,158	2,271	8,484	4,395	9,003	2,568	5,665	5,555
2	7,231	11,494	20,778	21,332	4,935	2,197	8,375	......	8,121	2,668	7,166	5,028
3	7,912	10,771	16,776	20,120	3,654	2,247	8,373	5,032	7,824	2,468	6,077	4,811
4	9,375	12,949	16,156	22,097	4,915	2,159	6,582	4,525	6,982	705	5,560	4,635
5	10,723	16,054	15,221	24,028	4,556	2,283	5,272	4,406	5,862	2,931	5,641	4,534
6	9,478	12,405	14,980	24,435	4,191	2,156	6,038	6,508	4,017	3,116	6,270	4,977
7	8,828	11,074	13,816	22,557	4,191	1,472	5,317	6,590	4,239	4,112	6,143	5,376
8	8,215	9,603	15,250	20,860	3,686	3,191	4,921	7,074	4,889	4,246	5,467	4,693
9	7,028	9,428	29,664	20,688	4,330	2,864	4,424	6,195	3,948	10,757	6,344	4,278
10	6,504	8,516	27,975	19,357	2,835	2,893	4,148	6,262	3,958	21,251	5,648	4,118
11	6,047	8,453	33,400	18,307	4,074	3,821	3,603	5,511	3,943	27,340	5,442	3,941
12	6,302	14,915	44,758	17,902	4,745	6,398	2,539	5,588	3,631	23,001	5,808	4,141
13	5,382	13,268	45,351	16,555	*a*	11,013	4,056	7,798	2,013	16,004	5,418	4,655
14	5,643	11,861	41,160	14,980	*a*	9,666	3,836	7,904	3,903	14,645	5,062	6,015
15	5,553	9,873	36,051	12,510	3,237	13,061	3,642	7,232	3,508	12,242	4,299	5,050
16	5,416	10,273	32,642	11,966	3,206	11,458	3,585	5,259	3,040	10,701	5,819	4,312
17	5,564	7,669	28,230	11,731	1,999	8,896	3,776	5,728	3,481	9,436	5,938	4,190
18	5,889	7,646	25,701	11,396	3,649	9,233	3,525	4,671	3,434	10,793	8,562	4,144
19	4,997	7,878	24,369	10,235	3,210	7,813	2,302	4,053	3,924	14,667	8,032	3,800
20	4,848	7,291	25,205	10,943	3,698	6,968	3,858	4,308	2,967	15,005	7,495	2,309
21	5,403	7,045	28,614	8,706	4,598	7,976	3,553	5,164	3,951	14,182	6,382	2,809
22	7,831	7,602	40,441	7,905	3,586	19,303	3,498	3,534	3,623	12,551	5,107	9,034
23	7,137	7,641	42,915	7,458	2,993	17,755	3,942	3,934	3,069	11,546	6,093	7,296
24	6,123	6,864	54,494	6,915	2,441	16,090	7,276	5,268	2,774	10,887	5,938	7,037
25	5,660	6,521	56,283	6,845	3,534	17,373	6,594	4,290	3,037	8,859	5,830	6,760
26	5,664	6,186	50,638	5,627	2,705	16,333	6,008	8,490	2,806	9,640	4,586	6,914
27	5,327	6,017	41,581	6,306	2,001	15,312	5,589	8,104	2,362	8,492	4,000	4,850
28	5,500	15,618	32,928	4,848	1,741	12,057	4,960	7,064	3,112	7,943	4,029	5,004
29	6,298	......	28,102	5,614	1,955	10,286	4,436	6,565	3,310	7,319	3,801	4,706
30	12,155	......	22,870	4,828	1,882	9,606	4,016	6,803	2,819	6,869	5,468	4,522
31	12,906	......	23,830	......	1,067	......	4,226	8,898	......	6,676	......	4,758

Estimated Monthly Discharge of Hudson River, Mechanicville, N. Y.

[Drainage area, 4,500 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January	12,906	4,848	7,084	1.56	1.80
February	16,054	6,017	9,885	2.19	2.28
March	56,283	13,816	30,938	6.87	7.92
April	24,435	4,828	14,013	3.11	3.47
May	5,158	1,067	3,509	.78	.90
June	19,303	1,472	8,472	1.88	2.10
July	8,484	2,302	4,863	1.08	1.25
August	8,898	3,534	5,905	1.31	1.51
September	9,003	2,013	4,118	.91	1.02
October	27,340	705	10,117	2.25	2.59
November	8,562	3,801	5,769	1.28	1.43
December	12,809	2,309	5,297	1.18	1.36
The year	....	....	....	....	27.63

a No record. [b] Flashboards at times irregular. Record approximated.

HOOSIC RIVER AT BUSKIRK, RENSSELAER COUNTY, N. Y.

A gauging station was established at the highway bridge in Buskirk Village September 25, 1903. Bert C. Henry, Observer. Gauge readings are taken twice each day from a chain gauge attached to the bridge.

Hoosic River has its headwaters on the west slope of Hoosic Mountains in Vermont and Massachusetts. Two head branches, one flowing southerly, the other northerly along the west slope of this range, join at North Adams, Mass. The stream then flows in a northwesterly direction, entering Hudson River three miles north of Mechanicville. The drainage basin above Buskirk has its greatest extent in a northerly and southerly direction; the main branches and the Little Hoosic and Walloomsac tributaries draining the valleys between parallel Mountain ranges. This portion of the drainage basin is rugged and precipitous, the distribution of tributaries affording rapid concentration of the run-off from the steep rock slopes. The soil is, as far as was learned from the brief reconnaissance, generally firm and tenacious in the valleys. The ridges are sparsely wooded. The general elevation of the valley at the junction of the headwaters is 1,000 feet.

At Buskirk, twenty-seven miles downstream, following the general trend of the valley, the elevation is 360 feet above tide. From Buskirk to the mouth of the stream, the drainage basin proper of the Hoosic River is relatively narrow; the only important tributary being the Tomhannock, which enters Hoosic River near its mouth, below all important falls. A storage reservoir is in process of erection on Tomhannock Creek, for the water supply for the City of Troy.

At Johnsonville, the stream is at elevation 300 feet at the foot of the falls. It enters Hudson River at elevation about 80 feet above tide, twelve miles farther downstream. The stretch intervening from Johnsonville to the mouth of the stream contains several precipitous falls over rock, and, receiving the largest part of the tributary drainage, it constitutes a favorable opportunity for power development, which has been largely utilized. Numerous dams affording power for textile, agricultural implement and other industries are scattered throughout the length of the stream from North Adams to Schaghticoke.[a] At the foot of the lowest of the four dams at Schaghticoke, the stream is at elevation 200 feet. The succeeding two miles includes a descent of about 80 feet, largely within an abrupt bend one mile in length, in which the stream returns within one-fourth mile of the starting point. This fall is undeveloped. There are no important lakes and but one storage reservoir in the drainage basin, this being at Farnam, near the head of the south branch. The pollution of the stream in Massachusetts and Connecticut, and its subsequent flow through New York State and into Hudson River presents an interstate sanitary problem of some interest. The largest tributary, Walloomsac River, is also an interstate stream.

The state boundary to the south of Hoosic River follows the Taconic Ridge, which forms the divide between the Hoosic in Massachusetts and the Little Hoosic River in New York.

Drainage Areas of the Hoosic River.[b]

LOCATION.	Area, place to place.	Total, square miles.
Above junction branches, North Adams, Mass	118.8	118.8
Above New York State Line	115.6	234.4
Above Hoosic Falls	118.5	352.9
Above mouth Walloomsac River	2.6	355.5
Walloomsac River, above mouth	159.0	514.5
Above Buskirk	64.1	578.6
Above Schaghticoke	56.7	635.3
Above mouth	80.5	715.8

List of Discharge Measurements of Hoosic River, at Buskirk, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1903.			
September 24	E. P. Roundey	1.80	816
October 10	E. P. Roundey	4.69	2,898
October 12	E. P. Roundey	3.32	1,322

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[a] Water power as it existed in 1880 is described in Vol. 16, 10th U. S. Census, 1880. Water Power, Pt. 1, pp. 375-380.

[b] From U. S. G. S. Topographic map, the drainage basin being shown on the Taconic and Mettawee quadrangles and the Cohoes sheet.

Mean Daily Gauge Height, feet, of Hoosic River, at Buskirk, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	......	......	......	......	1.78	1.96	2.19
2	......	......	......	......	......	......	......	......	......	1.80	2.16	2.03
3	......	......	......	......	......	......	......	......	......	1.80	2.11	2.13
4	......	......	......	......	......	......	......	......	......	1.65	1.86	2.19
5	......	......	......	......	......	......	......	......	......	1.88	2.29	2.11
6	......	......	......	......	......	......	......	......	......	2.25	2.73	2.01
7	......	......	......	......	......	......	......	......	......	2.02	2.36	2.11
8	......	......	......	......	......	......	......	......	......	1.98	2.21	1.93
9	......	......	......	......	......	......	......	......	......	6.85	2.23	1.96
10	......	......	......	......	......	......	......	......	......	4.95	2.19	1.99
11	......	......	......	......	......	......	......	......	......	3.62	2.16	2.11
12	......	......	......	......	......	......	......	......	......	3.40	2.16	1.86
13	......	......	......	......	......	......	......	......	......	3.05	2.18	2.19
14	......	......	......	......	......	......	......	......	......	2.82	1.99	3.03
15	......	......	......	......	......	......	......	......	......	2.65	1.98	3.23
16	......	......	......	......	......	......	......	......	......	2.65	2.16	4.01
17	......	......	......	......	......	......	......	......	......	2.68	2.76	3.88
18	......	......	......	......	......	......	......	......	......	3.47	3.83	3.63
19	......	......	......	......	......	......	......	......	......	3.42	3.03	3.58
20	......	......	......	......	......	......	......	......	......	3.05	2.53	3.59
21	......	......	......	......	......	......	......	......	......	2.85	2.43	5.96
22	......	......	......	......	......	......	......	......	......	2.72	2.49	3.69
23	......	......	......	......	......	......	......	......	......	2.68	2.53	3.16
24	......	......	......	......	......	......	......	......	......	2.61	2.58	2.91
25	......	......	......	......	......	......	......	......	1.70	2.53	2.41	2.78
26	......	......	......	......	......	......	......	......	1.72	2.50	2.09	2.66
27	......	......	......	......	......	......	......	......	1.65	2.30	2.31	2.21
28	......	......	......	......	......	......	......	......	1.98	2.33	2.19	3.86
29	......	......	......	......	......	......	......	......	1.95	2.29	2.06	3.73
30	......	......	......	......	......	......	......	......	1.80	2.26	2.30	4.09
31	......	......	......	......	......	......	......	......	......	2.19	......	4.11

INDIAN RIVER AT INDIAN LAKE DAM, HAMILTON COUNTY, N. Y.

A record of the stage of water in Indian Lake Storage Reservoir, located in the Upper Hudson River Drainage Basin, as described in preceding reports, has been continued.[a] The reported stage of water in the reservoir is shown in the accompanying table. The reservoir gates were not opened until November 25, 1903, the discharge previously having taken place through the spillway and logways only.

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[a] Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor, 1902, pp. 230 to 234.

Stage of Water in Indian Lake Reservoir, Hamilton Co., N. Y.[a]

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	25.0	21.17	20.25	35.42	34.33	32.75	32.75	30.46	31.29	27.92	28.50	24.58
2	24.83	21.25	20.67	35.42	34.33	32.58	32.58	30.33	31.37	27.75	28.36	24.25
3	24.75	21.21	21.00	35.42	34.38	32.33	32.58	30.17	31.42	27.62	28.25	23.88
4	24.67	21.17	21.25	35.92	34.42	32.08	32.62	30.08	31.42	27.50	28.17	23.50
5	24.58	21.13	21.33	35.92	34.50	31.83	32.67	30.33	31.42	27.42	28.00	23.16
6	24.5	21.08	21.33	35.75	34.62	31.50	32.67	30.50	31.42	27.42	27.86	22.75
7	24.33	20.92	21.33	35.67	34.75	31.17	32.71	30.58	31.33	27.38	27.75	22.38
8	24.17	20.83	21.33	35.54	34.75	30.83	32.75	30.75	31.21	27.33	27.67	22.00
9	24.04	20.75	21.67	35.42	34.75	30.46	32.75	30.86	31.08	28.08	27.58	21.70
10	23.92	20.67	22.00	35.46	34.75	30.17	32.75	31.00	30.92	29.08	27.50	21.42
11	23.75	20.67	22.50	35.42	34.75	29.83	32.67	31.21	30.75	29.83	27.42	21.12
12	23.58	20.71	23.17	35.42	34.75	30.00	32.5	31.42	30.58	30.08	27.33	20.83
13	23.42	20.75	23.83	35.42	34.71	30.00	32.25	31.58	30.42	30.17	27.25	20.54
14	23.33	20.75	24.42	35.33	34.71	30.12	32.00	31.75	30.25	30.25	27.17	20.25
15	23.21	20.75	24.83	35.25	34.67	30.21	31.75	31.83	30.12	30.33	27.08	19.92
16	23.08	20.75	25.42	35.17	34.67	30.29	31.50	31.92	30.00	30.33	27.00	19.58
17	22.96	20.75	25.83	35.08	34.67	30.38	31.29	31.96	29.88	30.25	27.00	19.25
18	22.83	20.71	26.17	35.00	34.29	30.42	31.08	31.96	29.75	30.33	27.00	18.92
19	22.67	20.67	26.83	34.92	34.25	30.46	30.88	32.00	29.71	30.50	27.00	18.58
20	22.50	20.58	27.67	34.83	33.83	30.50	30.75	32.04	29.58	30.42	26.96	18.42
21	22.33	20.50	29.08	34.75	33.79	30.83	30.58	32.08	29.46	30.33	26.92	18.16
22	22.21	20.33	30.42	34.67	33.42	31.42	30.42	31.92	29.33	30.17	26.83	17.92
23	22.08	20.17	31.67	34.58	33.42	31.83	30.33	31.67	29.21	29.96	26.79	17.66
24	22.0	20.00	33.42	36.50	33.33	32.33	30.25	31.42	29.08	29.75	26.75	17.42
25	21.83	19.83	34.83	34.42	33.29	32.50	30.29	31.17	28.92	29.62	26.71	17.16
26	21.67	19.67	35.17	34.38	33.29	32.83	30.33	31.08	28.75	29.42	26.67	17.08
27	21.54	19.58	35.33	34.33	33.25	32.96	30.42	31.08	28.58	29.25	26.33	16.92
28	21.42	19.83	35.33	34.33	33.25	33.08	30.46	31.12	28.42	29.08	25.83	16.75
29	21.29	......	35.25	34.33	35.25	33.17	30.50	31.12	28.25	28.92	25.42	16.58
30	21.17	......	35.17	34.33	33.08	33.0	30.54	31.17	28.08	28.75	25.00	16.42
31	21.17	......	35.25	......	32.92	......	30.54	31.21	......	28.62	......	16.25

MISCELLANEOUS DISCHARGE MEASUREMENTS, UPPER HUDSON RIVER DRAINAGE BASIN.

Hoosic River at Upper Bridge, Hoosic Falls, N. Y., September 15, 1903, by R. E. Horton.

Discharge 271 second-feet, measured by current meter. Drainage area, 353 square miles. Discharge .77 second-foot per square mile. No rainfall at Williamstown, Mass., in 15 days preceding. Water surface 23.3 feet below iron hand-rail plate 10 feet from left-hand abutment downstream side of bridge.

Hoosic River at Eagle Bridge, N. Y. September 15, 1903, by R. E. Horton.

Discharge 409 second-feet, measured by current meter. Drainage area, 573 square miles. Discharge, .71 second-foot per square mile. No rainfall at Williamstown, Mass., in 15 days preceding. Water surface 24.29 feet below hand-rail 10 feet from right-hand abutment upstream side of bridge.

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[a] Height of water above bottom of sluice gates.

Batten Kill at J. & G. R. R. Bridge over Middle Falls, N. Y.,[a] September 16, 1903, by R. E. Horton.

Discharge 169 second-feet, measured by current meter. Drainage area, 415 square miles. Discharge, .407 second-foot per square mile. .08-inch rainfall at Greenwich, N. Y., in 17 days preceding. Water surface 19.36 feet below top downstream guard rail 10 feet from left-hand end of bridge.

Fish Creek at Highway Bridge two miles above Grangerville, N. Y., September 16, 1903, by R. E. Horton.

Discharge 301 second-feet, measured by current meter. Drainage area, 260 square miles. Discharge, 1.16 second-feet per square mile. .05 inch rainfall at Spier Falls, N. Y., in 16 days preceding. Water surface 8.45 feet below top downstream corner right-hand abutment.

Fish Creek at point near mouth, spring 1872, by J. H. Shedd.[b]

Discharge 1963 second-feet, not stated how measured.

Sacandaga River at Northville, N. Y., September 22, 1903, by R. E. Horton.

Discharge 423 second-feet, measured by current meter. 1.12 inches rainfall at Indian Lake, N. Y., in 48 days preceding.

LOWER HUDSON RIVER DRAINAGE.[c]

FOUNDRY BROOK NEAR COLD SPRING, PUTNAM COUNTY, N. Y.

The drainage basin of this stream, which is shown on the Poughkeepsie sheet, No. 212, U. S. Geol. Survey Topographic map, lies east of Hudson River, from which it is separated by Breakneck Ridge. A gauging weir was erected near North Highland, October 31, 1902, by the engineers of the Fishkill-Matteawan Water Company, and readings were taken on a gauge placed 6 feet upstream from the weir at 7 a. m. and 6 p. m. until January 31, 1903. The

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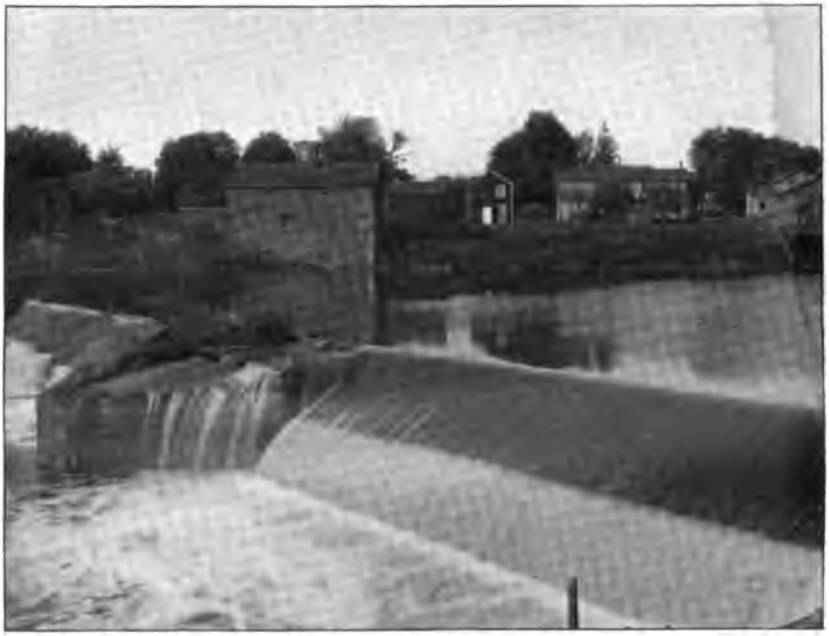
[a] This bridge ordinarily covers slackwater. Drawing down of pond below enabled measurement to be made.

[b] Trans. Am. Soc. C. E., Vol. 4, 1875, p. 300. This is stated to have been highest freshet there known in the stream.

[c] Results of gaugings at the following named station have been omitted from this report:
Rondout Creek at Honk Falls, N. Y.



Eighteen Mile Creek: Dam at Newfane, Niagara County, N. Y.

drainage area above the weir is of gneissic rock, precipitous, and covered with second growth hardwood trees and brush. Two storage reservoirs for a water power at the mouth of the stream are situated upstream from the point of gauging, having capacities as follows: Upper, 27,127,500 cubic feet; lower, 27,526,000 cubic feet. The upper one was empty and the lower nearly so when the gaugings began. The weir had a thin crest six feet in length, with two end contractions. The discharge was calculated by the Francis formula.

The stream makes a descent of nearly 300 feet in the lower two miles of its course, entering Hudson River below Cold Spring, where a power is developed under 90 feet fall.[a] The stream also serves as a source of water supply to Cold Spring Village, a reservoir of 12,000,000 gallons capacity being formed by a masonry dam.

The drainage area above the gauging weir is 1.38 square miles, and above the mouth of the stream 5.30 square miles.

Mean Daily Discharge, Second-feet, of Foundry Brook, Near Cold Spring, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
1	......	......	......	......	......	......	......	......	......	......	1.08	0.55
2	......	......	......	......	......	......	......	......	......	......	0.92	0.55
3	......	......	......	......	......	......	......	......	......	......	1.15	1.40
4	......	......	......	......	......	......	......	......	......	......	1.02	0.90
5	......	......	......	......	......	......	......	......	......	......	1.00	3.50
6	......	......	......	......	......	......	......	......	......	......	1.08	3.15
7	......	......	......	......	......	......	......	......	......	......	8.65	0.67
8	......	......	......	......	......	......	......	......	......	......	5.75	1.00
9	......	......	......	......	......	......	......	......	......	......	1.12	0.90
10	......	......	......	......	......	......	......	......	......	......	1.00	0.75
11	......	......	......	......	......	......	......	......	......	......	1.00	0.55
12	......	......	......	......	......	......	......	......	......	......	0.95	0.67
13	......	......	......	......	......	......	......	......	......	......	0.75	0.67
14	......	......	......	......	......	......	......	......	......	......	0.75	0.67
15	......	......	......	......	......	......	......	......	......	......	0.68	0.67
16	......	......	......	......	......	......	......	......	......	......	0.63	6.89
17	......	......	......	......	......	......	......	......	......	......	0.58	7.22
18	......	......	......	......	......	......	......	......	......	......	0.58	6.65
19	......	......	......	......	......	......	......	......	......	......	0.58	8.28
20	......	......	......	......	......	......	......	......	......	......	0.48	8.38
21	......	......	......	......	......	......	......	......	......	......	0.48	8.25
22	......	......	......	......	......	......	......	......	......	......	0.48	*a*
23	......	......	......	......	......	......	......	......	......	......	0.48	9.62
24	......	......	......	......	......	......	......	......	......	......	0.48	8.08
25	......	......	......	......	......	......	......	......	......	......	0.48	7.88
26	......	......	......	......	......	......	......	......	......	......	1.00	7.20
27	......	......	......	......	......	......	......	......	......	......	0.78	6.05
28	......	......	......	......	......	......	......	......	......	......	0.67	5.95
29	......	......	......	......	......	......	......	......	......	......	0.67	5.25
30	......	......	......	......	......	......	......	......	......	......	0.67	3.85
31	......	......	......	......	......	......	......	......	......	......	......	4.48

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[a] A modern turbine, a pelton type impulse wheel, and a 40-feet diameter overshot wheel (the last no longer used), stand side by side.

[a] Above weir.

Mean Daily Discharge, Second-feet, of Foundry Brook, Near Cold Spring, N. Y.—(Concl'd).

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	4.80	......	......	......	......	......	......	......	......	......	......	......
2	4.00	......	......	......	......	......	......	......	......	......	......	......
3	[a]	......	......	......	......	......	......	......	......	......	......	......
4	4.00	......	......	......	......	......	......	......	......	......	......	......
5	3.10	......	......	......	......	......	......	......	......	......	......	......
6	5.25	......	......	......	......	......	......	......	......	......	......	......
7	[a]8.10	......	......	......	......	......	......	......	......	......	......	......
8	5.55	......	......	......	......	......	......	......	......	......	......	......
9	4.48	......	......	......	......	......	......	......	......	......	......	......
10	3.75	......	......	......	......	......	......	......	......	......	......	......
11	1.80	......	......	......	......	......	......	......	......	......	......	......
12	1.80	......	......	......	......	......	......	......	......	......	......	......
13	1.28	......	......	......	......	......	......	......	......	......	......	......
14	1.28	......	......	......	......	......	......	......	......	......	......	......
15	1.80	......	......	......	......	......	......	......	......	......	......	......
16	2.18	......	......	......	......	......	......	......	......	......	......	......
17	2.40	......	......	......	......	......	......	......	......	......	......	......
18	2.35	......	......	......	......	......	......	......	......	......	......	......
19	2.00	......	......	......	......	......	......	......	......	......	......	......
20	1.80	......	......	......	......	......	......	......	......	......	......	......
21	10.15	......	......	......	......	......	......	......	......	......	......	......
22	8.10	......	......	......	......	......	......	......	......	......	......	......
23	5.62	......	......	......	......	......	......	......	......	......	......	......
24	3.40	......	......	......	......	......	......	......	......	......	......	......
25	3.10	......	......	......	......	......	......	......	......	......	......	......
26	2.85	......	......	......	......	......	......	......	......	......	......	......
27	2.80	......	......	......	......	......	......	......	......	......	......	......
28	3.25	......	......	......	......	......	......	......	......	......	......	......
29	3.60	......	......	......	......	......	......	......	......	......	......	......
30	4.20	......	......	......	......	......	......	......	......	......	......	......
31	3.35	......	......	......	......	......	......	......	......	......	......	......

FISHKILL CREEK AT GLENHAM, DUTCHESS COUNTY, N. Y.

A gauging station was established at the N. D. & C. R. R. Bridge in Glenham Village July 8, 1901, and the record was continued until November 7, 1903.[b]

The accompanying tables show the results of the current meter measurements, by means of which the daily discharge has been calculated from the stream stage as observed each morning and evening.[c]

The drainage basin of Fishkill Creek lies to the east of Hudson River, the headwaters being in the Fishkill Range. The main drainage basin is, however, comparatively flat, cleared and culti-

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[a] Drawing down lower storage pond.

[b] A description of the drainage basin, water power and additional high-water data will be found in the Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor of New York for the year 1902, pp. 284-289.

[c] Owing to changes in the gauge datum and to modification of the cross-section by the flood of December 15, 1901, the gauge heights as hitherto published have required special correction, determined from the observations, and do not therefore represent the correct relative stage of the stream on different dates. All gauge readings have been reduced to a common datum in calculating the daily discharge as here given.

vated, the most rapid descent being in the lower five miles of its course in which the stream falls nearly 200 feet. The drainage basin contains a small number of lakes and marshy tracts, also a limited storage in Whaley Pond.[a]

Mean Daily Discharge, Second-Feet, of Fishkill Creek, at Glenham, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	......	......	......	......	......	......	......	134	351	157	137	124
2	......	......	......	......	......	......	......	117	361	137	134	a93
3	......	......	......	......	......	......	......	111	305	174	134	108
4	......	......	......	......	......	......	......	98	285	174	134	109
5	......	......	......	......	......	......	......	95	243	140	127	114
6	......	......	......	......	......	......	......	95	192	130	127	144
7	......	......	......	......	......	......	......	409	202	127	130	150
8	......	......	......	......	......	......	127	876	174	124	134	130
9	......	......	......	......	......	......	127	448	167	121	127	108
10	......	......	......	......	......	......	114	261	147	121	124	414
11	......	......	......	......	......	......	111	181	157	121	124	731
12	......	......	......	......	......	......	117	167	271	114	130	463
13	......	......	......	......	......	......	114	147	250	114	250	351
14	......	......	......	......	......	......	104	127	192	243	202	390
15	......	......	......	......	......	......	101	127	174	482	157	798
16	......	......	......	......	......	......	95	117	226	468	140	2,185
17	......	......	......	......	......	......	104	121	192	337	134	1,364
18	......	......	......	......	......	......	216	601	216	278	134	846
19	......	......	......	......	......	......	140	409	181	250	134	829
20	......	......	......	......	......	......	127	278	147	216	134	535
21	......	......	......	......	......	......	111	295	147	209	131	438
22	......	......	......	......	......	......	101	531	140	192	131	414
23	......	......	......	......	......	......	95	371	130	181	127	414
24	......	......	......	......	......	......	95	409	127	174	127	327
25	......	......	......	......	......	......	95	1,515	124	157	261	351
26	......	......	......	......	......	......	91	1,630	121	140	254	327
27	......	......	......	......	......	......	88	951	114	140	185	472
28	......	......	......	......	......	......	75	668	124	140	150	629
29	......	......	......	......	......	......	85	482	134	140	140	424
30	......	......	......	......	......	......	261	409	208	140	137	*3,000
31	......	......	......	......	......	......	192	351	......	137	......	*2,330
Mean	......	......	......	......	......	......	120	404	193	186	150	610

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[a] The drainage basin of Fishkill Creek is shown on the Poughkeepsie, Rhinebeck, Millbrook, Clove and West Point quadrangles, Nos. 212, 211, 229, 230 and 213 U. S. Geol. Survey Topographic map.

* Estimated from Logarithmic curve.

Mean Daily Discharge, Second-feet, of Fishkill Creek, at Glenham, N. Y.—(Concluded).

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
1	1,230	845	*b* 13,700	544	874	172	148	190	50	332	380	172
2	1,670	265	*b* 4,300	486	544	142	106	166	44	316	348	*a* 178
3	821	598	3,480	438	451	118	95	142	55	252	316	214
4	708	564	1,790	404	451	142	184	142	40	202	300	260
5	640	579	1,100	364	404	142	124	118	50	202	268	244
6	332	454	568	348	348	106	148	100	55	316	260	172
7	285	442	615	364	316	98	148	112	50	316	252	172
8	253	845	676	404	300	178	112	98	55	228	252	*a* 196
9	237	414	1,170	645	268	178	95	98	60	208	228	111
10	228	361	2,630	956	236	154	90	87	92	190	220	126
11	222	265	1,990	890	184	118	90	118	85	172	214	91
12	216	282	1,630	752	202	98	81	202	68	645	214	98
13	268	219	1,790	615	196	87	72	154	90	691	214	126
14	348	170	1,730	544	184	90	71	112	82	451	214	136
15	253	154	1,230	498	184	98	62	100	80	364	196	176
16	162	140	992	450	184	98	62	92	75	316	202	198
17	148	187	1,810	404	160	202	60	85	75	276	196	1,240
18	142	166	1,590	392	136	142	60	77	77	252	172	2,590
19	142	154	1,030	364	148	98	59	77	60	252	172	1,750
20	128	160	706	332	160	100	70	72	65	236	166	244
21	128	166	768	316	160	98	268	68	62	220	154	992
22	728	297	722	300	130	154	474	72	75	196	148	2,750
23	*a*1,130	297	661	268	130	118	451	68	68	196	148	2,990
24	623	314	592	252	112	98	252	68	72	172	154	2,150
25	419	250	521	220	112	87	284	72	55	184	154	645
26	361	297	474	220	268	98	252	62	118	178	172	1,060
27	540	723	451	236	252	87	236	58	148	172	236	920
28	540	2,096	380	228	392	77	196	58	148	498	214	706
29	*a* 332	......	521	208	268	82	172	52	568	938	192	630
30	365	......	828	498	208	236	284	52	544	630	172	615
31	332	......	615	......	184	......	208	48	......	451	......	544
Mean	449	382	1,647	431	262	123	162	97	106	324	218	726
1903.												
1	498	532	3,130	768	190	87	1,770	300	938	166	372	......
2	462	462	1,610	580	166	85	1,170	202	661	166	332	......
3	645	615	1,080	509	166	77	752	166	568	166	308	......
4	1,120	737	859	544	178	77	580	190	509	160	308	......
5	828	1,360	768	737	172	75	462	438	415	148	308	......
6	645	1,190	722	544	160	68	462	603	415	142	308	......
7	556	828	603	486	142	65	415	1,120	364	142	*d* 284	......
8	521	568	630	630	130	85	284	1,420	308	148	......	......
9	*c* 297	568	1,230	1,240	118	178	276	813	276	4,690	......	......
10	348	498	1,230	1,240	106	130	244	580	276	6,910	......	......
11	373	462	1,050	920	112	154	214	462	276	3,130	......	......
12	474	859	1,060	737	98	178	214	415	244	2,290	......	......
13	414	874	859	615	98	208	214	380	214	1,690	......	......
14	486	706	737	568	98	276	244	316	196	1,420	......	......
15	474	556	661	592	172	521	208	276	190	1,080	......	......
16	223	509	592	568	130	992	166	244	190	974	......	......
17	228	365	544	509	98	904	166	244	556	904	......	......
18	176	340	486	451	98	592	166	244	661	938	......	......
19	152	356	462	380	90	509	208	214	462	938	......	......
20	243	364	415	364	92	521	190	292	340	722	......	......
21	223	364	380	340	85	844	202	332	308	603	......	......
22	1,025	392	580	276	82	1,630	190	284	276	556	......	......
23	507	392	1,010	292	75	1,690	308	244	260	532	......	......
24	268	348	2,250	284	68	1,420	308	184	220	676	......	......
25	406	332	1,690	276	70	1,240	190	208	208	580	......	......
26	386	316	1,230	252	77	938	178	462	190	486	......	......
27	474	276	1,010	236	72	706	166	348	190	415	......	......
28	404	1,120	844	214	77	509	130	324	190	392	......	......
29	768	......	722	208	244	691	112	509	190	372	......	......
30	920	......	645	190	130	1,490	292	813	166	372	......	......
31	782	......	798	......	100	......	404	1,260	......	372	......	......
Mean	494	581	964	518	119	564	351	448	342	751	317	......

a Taken from ice curve, December 2 to 9 inclusive.
a Taken from ice curve, December 9 to December 17 inclusive.
a Taken from ice curve, January 6 to January 23 inclusive.
a Taken from ice curve, January 29 to February 27 inclusive.
b Estimated at Groveville Dam.
c Taken from ice curve, January 9 to January 26 inclusive.
d End of record.

Estimated Monthly Discharge of Fishkill Creek, at Glenham, N. Y.

[Drainage area, 198 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1901.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	....	....	....	....	....
June	....	....	....	....	....
July	261	75	120	.606	.70
August	1,630	95	404	2.04	2.35
September	361	114	193	.975	1.09
October	482	114	186	.939	1.08
November	261	124	150	.758	.85
December	3,000	93	610	3.08	3.55
1902.					
January	1,670	128	449	2.267	2.61
February	2,096	140	382	1.929	2.00
March	13,700	380	1,647	8.317	9.59
April	956	208	431	2.206	2.47
May	874	112	262	1.323	1.52
June	236	77	123	.621	.69
July	474	60	162	.818	.94
August	202	48	97	.490	.56
September	568	40	106	.535	.60
October	938	160	324	1.636	1.89
November	380	148	218	1.10	1.23
December	2,990	91	726	3.666	4.22
1903.					
January	1,100	152	494	2.494	2.87
February	1,360	276	581	2.934	3.04
March	3,130	389	964	4.868	5.60
April	1,240	190	518	2.616	2.92
May	244	68	119	.600	.69
June	1,490	65	564	2.848	3.17
July	1,770	112	351	1.772	2.04
August	1,420	184	448	2.262	2.61
September	938	166	342	1.727	1.92
October	6,910	142	751	1.772	2.04
November	872	284	817	1.600	1.79

Current-meter Discharge Measurements of Fishkill Creek, at Glenham, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1901.				
July	8	R. E. Horton G. B. Hollister	3.92	147.2
July	20	A. E. Place	3.90	134.9
July	24	A. E. Place	3.60	59.7
August	15	A. E. Place	3.85	110.5
August	21	A. E. Place	4.56	341.7
September	6	A. E. Place	4.15	193.4
September	18	A. E. Place	4.22	229.0
September	27	W. W. Schlecht	3.86	89.9
October	5	W. W. Schlecht	3.98	126.5
October	12	G. B. Hollister	4.80	97.4
October	15	W. W. Schlecht	5.10	579.2
October	25	W. W. Schlecht	4.05	136.9
November	11	W. W. Schlecht	3.85	82.2
November	20	W. W. Schlecht	3.95	114.0
December	7	W. W. Schlecht	4.23	*a* 100.7
December	18	W. W. Schlecht	4.60	374.8
December	24	W. W. Schlecht	4.50	314.9
December	31	W. W. Schlecht	7.41	233.5

a Ice 0.4′ thick.

Current-meter Discharge Measurements of Fishkill Creek, at Glenham, N. Y.—(Concluded).

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1902.				
January	17	W. W. Schlecht	4.27	*b* 171.5
February	1	W. W. Schlecht	5.01	474.2
February	11	W. W. Schlecht	4.83	*a* 202.5
March	5	W. W. Schlecht	5.74	1,129.0
April	12	W. W. Schlecht	5.24	772.6
April	25	W. W. Schlecht	3.97	152.4
May	6	W. W. Schlecht	4.40	349.5
June	2	W. W. Schlecht	3.75	132.3
June	17	W. W. Schlecht	3.97	212.5
July	14	W. W. Schlecht	3.19	64.4
July	28	W. W. Schlecht	3.91	200
August	11	W. W. Schlecht	3.58	115
August	26	W. W. Schlecht	3.11	48.5
October	11	P. M. Churchill	3.81	155
October	30	C. C. Covert	5.07	647.7
November	8	F. H. Tillinghast	4.09	233
November	25	F. H. Tillinghast	3.74	145.8
1903.				
January	13	F. H. Tillinghast	5.09	*b* 261.0
March	2	F. H. Tillinghast	6.28	152.0
May	13	F. H. Tillinghast	3.48	99.2
May	21	F. H. Tillinghast	3.42	80.0
July	28	F. H. Tillinghast	3.63	116
September	5	F. H. Tillinghast	4.60	345

WAPPINGER CREEK AT WAPPINGER FALLS, DUTCHESS COUNTY, N. Y.

A gauging station was established at the first highway bridge crossing Wappinger Creek above the Village of Wappinger Falls, May 19, 1903.

Observations of the stage of the stream on a graduated vertical scale attached to the central bridge pier are taken twice each day by Lee Jackson.

Wappinger Creek is tributary to Hudson River. The drainage basin comprises a hilly plateau 400 to 600 feet above tide, nearly rectangular in shape, and including numerous small lakes and marsh areas. Winding branched tributaries gather the run-off from the numerous hills which dot the area. At a point about 16 miles from the mouth of the stream the basin becomes much narrower and the differences of elevation are of less magnitude. The stream flows near the right-hand side of a valley three to four miles in width; gradually descending to Wappinger Falls where it makes a sudden descent to nearly tide water level, the elevation of the Wappinger Pond being about 78 feet.[c]

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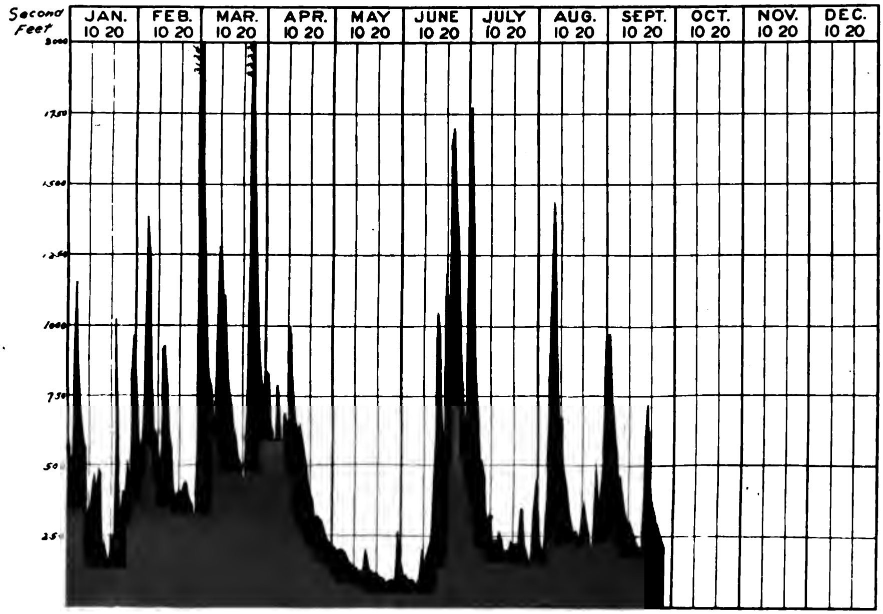
[a] Ice 0.2′ to 0.8′ thick.

[b] Ice below stage.

[c] The drainage basin is shown on the Poughkeepsie, Rhinebeck, Millbrook and Clove quadrangles Nos. 212, 211, 229 and 230 of the U. S. Geol. Survey Topographic map from which the drainage area as given has been determined.



Discharge of Fishkill Creek at Glenham, Dutchess County, N. Y., 1903.

Drainage Area of Wappinger Creek.

	Area, place to place.	Total area, square miles.
East branch Wappinger Creek above Stanfordville	40.0	40.0
East branch above junction with west branch	67.4	107.4
West branch above mouth	33.8	33.8
Total area of east and west branches	....	141.2
Wappinger Creek above Van Wagner's	33.8	175.0
Wappinger Creek above Central Falls	14.7	189.7
Wappinger Creek above gauging station	4.78	194.4
Wappinger Creek above Wappinger Falls	7.81	202.2
Wappinger Creek above mouth	13.7	215.9

The bridge from which the gaugings are made has two spans of 43.4 feet and 46.5 feet, respectively. The channel of the stream is sand and gravel, with some boulders. The stream is straight for a distance of about 250 feet above the bridge and about 300 feet downstream from the bridge. The bench mark is a spike in the root of blazed tree south side of road 50 feet east of bridge.

Assumed elevation	100.00
Elevation datum plane of gauge	90.81

But little power is developed on the stream. At Wappinger Falls a bleaching and dyeing establishment utilizes 22 feet fall.

Current-meter Discharge Measurements of Wappinger Creek, at Wappinger Falls, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second feet.
	1903.			
May	19	E. P. Roundey	0.6	62
June	16	F. H. Tillinghast	4.5	1,368
July	7	F. H. Tillinghast	1.7	317
July	27	E. P. Roundey	0.9	127
August	1	E. P. Roundey	1.1	166
August	1	E. P. Roundey	1.1	169
September	8	F. H. Tillinghast	2.35	567
September	17	E. P. Roundey	1.5	305

Mean Daily Gauge Height, feet, of Wappinger Creek, at Wappinger Falls, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	.55	3.25	1.35	2.95	.70	1.30	1.30
2	......	......	......	......	......	.50	2.80	1.20	2.60	.70	1.30	1.55
3	......	......	......	......	......	.50	2.35	1.05	2.25	.65	1.20	1.30
4	......	......	......	......	......	.35	2.05	1.00	2.10	.70	1.20	1.10
5	......	......	......	......	......	.45	1.95	2.60	1.90	.70	1.20	1.65
6	......	......	......	......	......	.45	1.80	2.95	1.75	.70	1.80	1.35
7	......	......	......	......	......	.35	1.75	4.70	1.55	.70	1.30	1.30
8	......	......	......	......	......	.65	1.70	2.85	1.50	2.00	1.30	1.25
9	......	......	......	......	......	.90	1.55	2.25	1.40	7.35	1.25	1.20
10	......	......	......	......	......	.75	1.85	2.00	1.30	7.75	1.35	1.20
11	......	......	......	......	......	1.05	1.15	1.70	1.20	5.35	1.40	1.25
12	......	......	......	......	......	4.20	1.10	1.60	1.20	4.40	1.30	1.20
13	......	......	......	......	......	3.95	1.10	1.55	1.20	3.60	1.15	1.05
14	......	......	......	......	......	2.80	1.10	1.45	1.20	3.10	1.10	1.45
15	......	......	......	......	......	3.15	1.10	1.30	1.20	2.75	1.00	1.50
16	......	......	......	......	......	4.40	1.10	1.30	1.20	2.45	1.20	1.50
17	......	......	......	......	......	3.55	1.00	1.30	1.35	2.30	2.15	1.50
18	......	......	......	......	......	3.00	1.00	1.30	1.75	2.70	2.75	1.50
19	......	......	......	......	.60	2.60	1.10	1.25	1.50	2.35	2.15	1.50
20	......	......	......	......	.55	2.60	1.10	1.30	1.10	2.10	1.85	1.75
21	......	......	......	......	.50	4.60	1.45	1.25	1.00	2.00	1.65	4.10
22	......	......	......	......	.50	5.70	1.50	1.15	1.00	1.90	1.50	7.25
23	......	......	......	......	.50	4.30	1.90	1.05	1.00	1.85	1.50	7.35
24	......	......	......	......	.45	4.20	1.25	.90	.95	2.10	1.50	5.80
25	......	......	......	......	.50	3.65	1.15	1.20	.75	1.95	1.50	4.55
26	......	......	......	......	.40	3.20	1.10	1.60	.70	1.70	1.40	4.10
27	......	......	......	......	.35	2.80	.95	1.50	.70	1.60	1.30	3.15
28	......	......	......	......	.55	2.35	.75	1.55	.90	1.55	1.15	2.45
29	......	......	......	......	1.25	2.55	.80	1.70	.85	1.50	......	2.25
30	......	......	......	......	1.25	4.55	1.95	2.35	.70	1.50	......	2.20
31	......	......	......	......	.65	......	1.50	3.15	......	1.40	......	2.20

WALLKILL RIVER AT NEW PALTZ, ULSTER COUNTY, N. Y.

A gauging station was established on this stream at the highway bridge in New Paltz July 7, 1901, and continued until November 10, 1903. Observations of the stream stage were taken each morning and night by the local observer. A record was also made of the thickness and condition of ice when the stream was frozen over, and special discharge measurements were made to determine the flow during the ice period. A list of all the discharge measurements made reduced to a uniform gauge datum is given herewith. The daily discharge, which is also given, has been determined from the discharge measurements and corrected daily gauge heights, using special calibration curves for the stream section when frozen over.

The drainage basin of Wallkill River is diversified, comprising a portion of the Highlands in New Jersey and a plain 28 square miles in extent, formerly swampy land, which has been reclaimed by drainage.[a]

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[a] For description of Water Power, see Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor of New York for 1902, pp. 278-284.
The gauge heights and discharge there given have since been revised.

Current-meter Discharge Measurements of Wallkill River, at New Paltz, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-feet.
	1901.			
July	7	R. E. Horton & G. B. Hollister.	7.19	823.9
July	8	R. E. Horton & G. B. Hollister.	7.25	842.6
July	19	G. B. Hollister	8.21	1,242.7
July	23	A. E. Place	6.18	305.8
August	7	A. E. Place	14.79	7,365
August	13	A. E. Place	7.79	1,037
August	20	A. E. Place	9.90	2,729
August	28	A. E. Place	10.50	2,982
August	31	A. E. Place	8.97	1,917
September	5	A. E. Place	8.80	1,676
September	19	A. E. Place	7.63	1,076
October	1	W. W. Schlecht	7.26	896.3
October	9	W. W. Schlecht	6.38	398.5
October	11	W. W. Schlecht	6.20	340.1
October	11	W. W. Schlecht	6.20	355.2
October	24	W. W. Schlecht	6.23	332.8
November	9	W. W. Schlecht	5.84	178.2
November	16	W. W. Schlecht	6.40	402.2
November	27	W. W. Schlecht	7.42	1,022
December	11	W. W. Schlecht	11.40	*a* 3,039.6
December	19	W. W. Schlecht	13.60	*b* 3,277
	1902.			
January	21	W. W. Schlecht	7.14	*c* 332
January	23	W. W. Schlecht	17.23	*c* 6,063
January	31	W. W. Schlecht	8.97	*d* 1,167
February	10	W. W. Schlecht	7.68	*d* 597
February	24	W. W. Schlecht	7.23	*d* 288
March	11	W. W. Schlecht	15.83	7,140
April	9	W. W. Schlecht	13.11	5,854
April	21	W. W. Schlecht	7.47	1,028
April	26	W. W. Schlecht	6.82	680
May	1	W. W. Schlecht	10.16	2,623
May	13	W. W. Schlecht	6.58	506
May	21	W. W. Schlecht	6.23	344
June	6	W. W. Schlecht	6.30	381
June	19	W. W. Schlecht	6.08	295
July	16	H. K. Barrows	5.60	124.3
July	29	H. K. Barrows	7.39	942
August	6	H. K. Barrows	7.88	1,150
August	15	H. K. Barrows	6.62	518
August	28	H. K. Barrows	5.76	169
September	18	H. K. Barrows & P. M. Churchill	5.86	209.5
November	4	F. H. Tillinghast	7.85	1,165
November	18	F. H. Tillinghast	6.52	549.5
December	2	F. H. Tillinghast	6.70	626
	1903.			
January	7	F. H. Tillinghast	11.10	*e* 2,293
February	10	F. H. Tillinghast	10.80	*c* 2,028
February	26	F. H. Tillinghast	8.75	*f* 945
March	4	F. H. Tillinghast	15.75	5,985
March	9	F. H. Tillinghast	13.15	5,398
March	24	F. H. Tillinghast	14.85	6,821
April	9	F. H. Tillinghast	12.55	4,858
May	12	F. H. Tillinghast	6.18	370
May	21	F. H. Tillinghast	5.75	107

a Ice 0.7′ thick at station.
b Ice.
c Ice 1.0′ to 1.4′ thick at station.
d Ice 1.0′ to 2.0′ thick at station.
e Ice 0.7′ to 0.8′ thick at station.
f Ice 0.6′ to 1.2′ thick at station.

Mean Daily Discharge, Second-Feet, of Wallkill River, at New Paltz, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901												
1.	......	......	......	......	......	......	......	260	1,999	919	229	325
2.	......	......	......	......	......	......	......	198	2,453	811	229	245
3.	......	......	......	......	......	......	......	223	2,382	757	229	229
4.	......	......	......	......	......	......	......	229	2,003	680	229	304
5.	......	......	......	......	......	......	......	413	1,569	654	245	369
6.	......	......	......	......	......	......	......	413	1,445	604	260	503
7.	......	......	......	......	......	......	881	4,208	1,261	503	229	478
8.	......	......	......	......	......	......	854	3,535	1,058	420	214	838
9.	......	......	......	......	......	......	689	2,068	903	369	183	2,559
10.	......	......	......	......	......	......	554	1,964	919	347	152	4,422
11.	......	......	......	......	......	......	488	1,930	811	347	121	3,914
12.	......	......	......	......	......	......	902	1,261	705	304	214	2,782
13.	......	......	......	......	......	......	1,058	1,058	757	304	391	2,595
14.	......	......	......	......	......	......	811	757	654	369	680	3,010
15.	......	......	......	......	......	......	654	892	503	946	629	5,300
16.	......	......	......	......	......	......	503	730	554	1,145	456	4,900
17.	......	......	......	......	......	......	420	554	705	946	325	5,120
18.	......	......	......	......	......	......	811	2,034	1,012	828	245	5,615
19.	......	......	......	......	......	......	1,267	3,452	1,029	757	282	5,705
20.	......	......	......	......	......	......	829	2,668	919	654	369	4,988
21.	......	......	......	......	......	......	469	2,744	838	528	838	3,914
22.	......	......	......	......	......	......	404	2,744	730	413	1,290	3,090
23.	......	......	......	......	......	......	360	2,668	654	356	1,633	2,896
24.	......	......	......	......	......	......	273	2,346	589	347	1,445	2,668
25.	......	......	......	......	......	......	254	6,200	503	304	1,290	2,241
26.	......	......	......	......	......	......	254	4,166	434	269	919	1,864
27.	......	......	......	......	......	......	207	3,535	369	260	654	2,034
28.	......	......	......	......	......	......	207	3,010	369	260	604	2,346
29.	......	......	......	......	......	......	207	2,630	503	260	503	3,998
30.	......	......	......	......	......	......	192	2,488	811	260	413	11,935
31.	......	......	......	......	......	......	238	1,965	......	434	......	11,840
Mean	......	......	......	......	......	......	551	2,043	981	528	517	3,323
1902.												
1.	[a]4,974	949	20,892	2,102	2,744	946	811	2,206	260	2,744	1,633	579
2.	3,590	949	21,620	1,831	1,831	811	757	1,930	245	3,210	1,445	528
3.	3,490	2,011	23,830	1,633	1,965	705	1,116	1,699	229	2,668	1,321	946
4.	2,928	1,453	19,030	1,352	1,765	629	989	1,600	192	2,311	1,203	1,203
5.	1,892	1,482	13,785	1,232	1,445	456	720	1,414	161	2,275	1,029	1,290
6.	2,042	1,026	7,034	2,346	1,203	369	569	1,203	136	2,630	946	1,569
7.	1,744	668	5,210	1,058	946	347	443	1,145	105	2,172	946	1,290
8.	1,453	535	4,768	1,476	919	325	369	1,029	70	1,864	1,029	1,058
9.	1,155	504	6,752	5,615	865	347	312	838	70	1,569	757	1,058
10.	1,000	469	8,247	5,480	730	434	260	705	260	1,321	654	1,029
11.	949	407	7,698	4,336	579	369	229	629	413	1,383	554	*425
12.	690	407	7,890	3,872	503	347	229	579	347	4,988	528	*425
13.	623	353	8,877	3,050	478	304	198	554	369	4,082	478	*407
14.	623	335	8,298	2,417	456	282	161	518	413	2,934	478	*389
15.	601	263	6,846	2,102	434	260	136	478	325	2,346	478	*389
16.	601	245	6,517	1,633	413	304	136	443	282	2,102	434	*389
17.	469	281	7,222	1,352	478	325	142	400	245	1,864	434	*2,993
18.	407	263	5,705	1,232	347	282	100	382	214	1,600	434	*3,026
19.	389	239	3,956	1,145	347	269	90	339	167	1,600	434	*3,059
20.	281	214	3,010	1,000	347	260	260	304	198	1,321	434	*3,059
21.	281	230	2,782	919	347	269	946	347	198	1,116	391	*3,490
22.	7,320	230	2,706	865	347	356	1,633	260	198	1,029	391	*7,700
23.	6,707	245	2,382	757	325	391	892	245	198	935	503	*8,160
24.	3,887	299	2,275	730	304	369	3,090	260	198	854	347	*6,395
25.	3,623	317	2,172	654	304	304	5,930	245	282	757	347	*5,732
26.	2,993	491	1,864	604	413	304	1,930	229	2,311	654	369	*5,214
27.	3,423	2,479	1,538	680	1,414	260	1,538	229	4,166	604	865	*4,328
28.	3,289	3,356	1,352	413	1,999	235	1,116	214	4,082	3,872	865	*4,328
29.	2,321	......	2,706	503	1,476	269	919	1,383	5,435	3,535	730	*4,056
30.	1,342	......	3,370	3,960	1,414	680	919	811	2,820	2,172	654	*3,722
31.	1,208	......	2,488	......	1,174	......	1,507	391	......	1,831	......	*2,702
Mean	2,139	739	7,188	1,878	913	394	918	742	820	2,076	704	2,611

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[a] Taken from ice curve, January 1 to February 28 inclusive.
*** Taken from ice curve, December 11 to 31 inclusive.**

Mean Daily Discharge, Second-Feet, of Wallkill River, at New Paltz, N. Y.— (Concluded).

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	*2,669	*2,734	*9,007	2,524	654	167	4,422	528	3,746	304	629	......
2	*2,605	*2,863	*7,040	2,068	554	152	3,452	413	2,630	304	629	......
3	*3,190	*4,328	*5,595	1,864	503	167	3,050	434	1,290	304	604	......
4	*3,689	*3,887	*5,316	2,003	478	152	2,452	629	1,203	304	528	......
5	*3,356	*4,668	*4,192	2,137	478	136	2,206	5,840	1,290	304	629	......
6	*2,702	*3,456	3,290	1,699	456	121	1,864	4,680	1,445	304	629	......
7	*2,290	*2,928	3,010	1,538	434	121	1,600	7,363	1,203	412	629	......
8	*2,042	*2,669	2,972	2,896	434	152	1,352	5,120	1,029	11,050	629	......
9	*1,744	*2,473	4,508	5,210	391	282	1,145	......	919	18,700	478	......
10	*1,482	*2,321	4,637	3,704	347	391	946	......	784	15,020	478	......
11	*1,288	*2,734	4,856	2,595	304	503	811	......	730	16,060	478	......
12	*1,181	*5,937	3,746	2,275	304	3,535	705	......	730	14,160	......	......
13	*1,128	*5,664	2,706	2,034	282	4,637	629	......	654	12,120	......	......
14	*1,208	*4,464	2,137	1,798	282	3,535	579	......	503	8,660	......	......
15	*1,1z8	*3,887	1,930	3,914	282	7,222	503	......	434	5,660	......	......
16	*1,128	*3,389	1,765	5,525	304	6,846	518	579	730	4,680	......	......
17	*1,000	*3,255	1,732	4,422	282	4,768	478	973	1,765	3,540	......	......
18	*923	*3,125	1,633	3,788	282	3,914	503	838	1,476	3,330	......	......
19	*849	*3,059	1,445	3,170	245	3,452	705	784	973	2,520	......	......
20	*781	*1,598	1,321	2,595	229	......	838	811	919	2,170	......	......
21	*1,000	*1,511	1,290	2,137	198	7,794	1,029	838	865	1,900	......	......
22	*1,951	*1,369	3,090	1,798	198	6,611	946	784	784	1,700	......	......
23	*2,042	*1,262	5,032	1,538	214	5,210	2,346	680	757	1,510	......	......
24	*1,569	*1,262	6,940	1,383	214	6,658	1,897	654	604	1,380	......	......
25	*1,235	*1,103	4,768	1,116	183	5,345	1,699	784	503	1,200	......	......
26	*1,026	*1,000	3,746	1,087	167	4,293	1,864	1,000	413	1,090	......	......
27	*974	*949	3,090	973	167	3,370	1,383	680	369	1,030	......	......
28	*1,181	*3,590	2,630	892	183	2,668	579	680	369	946	......	......
29	*1,892	......	2,172	811	214	3,410	554	6,846	390	811	......	......
30	*2,042	......	1,798	705	214	5,885	1,145	6,380	325	730	......	......
31	*2,290	......	2,896	......	183	......	757	5,345	......	654	......	......
Mean	1,729	2,910	2,558	2,340	312	3,155	1,386	2,236	1,091	4,286	577	......

Estimated Monthly Discharge of Wallkill River, at New Paltz, N. Y.
[Drainage area, 736 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1901.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	....	....	....	....	....
June	....	....	....	....	....
July	1,267	192	551	.749	.86
August	6,200	198	2,043	2.778	3.21
September	2,453	369	981	1.334	1.48
October	1,145	260	528	.718	.83
November	1,638	121	517	.703	.78
December	11,935	229	3,323	4.519	5.21

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* From ice curve.

Estimated Monthly Discharge of Wallkill River, at New Paltz, N. Y.—(Concluded).
[Drainage area, 736 square miles.]

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1902.					
January	7,320	281	2,139	2.909	3.35
February	8,356	214	739	1.005	1.05
March	23,830	1,352	7,186	9.776	11.27
April	5,615	413	1,878	2.554	2.85
May	2,744	304	913	1.242	1.43
June	946	235	394	.536	.60
July	5,930	90	918	1.248	1.44
August	2,206	214	742	1.009	1.16
September	5,435	70	820	1.115	1.25
October	4,988	604	2,076	2.823	3.25
November	1,633	347	704	.957	1.07
December	8,160	389	2,611	3.551	4.09
1903.					
January	3,689	781	1,729	2.351	2.71
February	5,937	949	2,910	3.958	4.12
March	9,007	1,290	2,558	3.479	4.01
April	5,525	705	2,340	3.182	3.55
May	654	167	312	.424	.48
June	7,794	121	3,155	4.291	4.79
July	4,422	478	1,386	1.885	2.18
August	7,363	413	2,236	3.041	3.50
September	3,746	413	1,091	1.484	1.65
October	18,700	304	4,286	5.828	6.70
November 1-11 incl	620	478	577	.784	.87

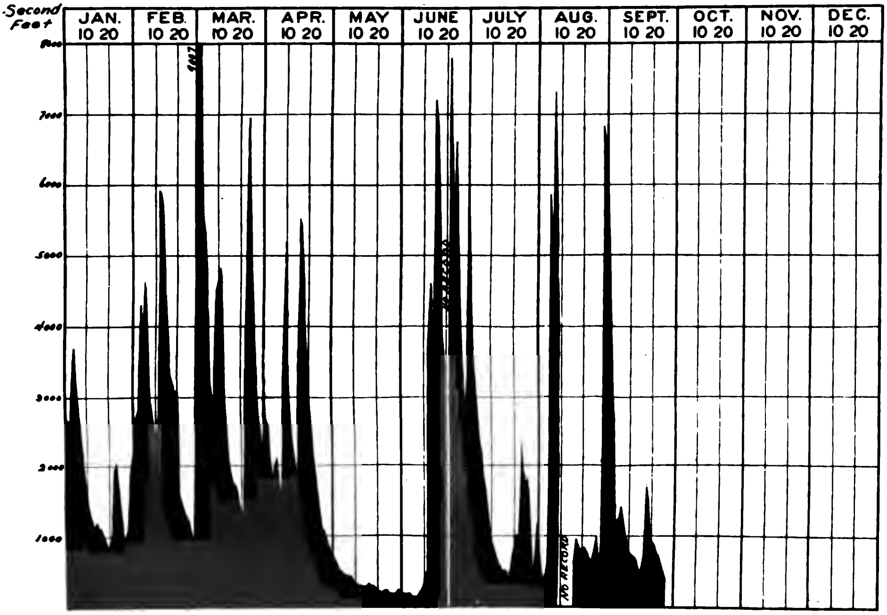
RONDOUT CREEK AND DELAWARE AND HUDSON CANAL AT ROSENDALE, ULSTER COUNTY, N. Y.

A gauging station was maintained at Rondout Creek at the highway bridge in Rosendale from July 6, 1901, to November 7, 1903, inclusive.

The stream stage was observed each morning and night, by Anna Huben, from a weight and chain gauge attached to outriggers on the bridge.

The accompanying table shows the results of current meter measurements that were made to obtain calibration curves for the stream cross-section; these include measurements made at times when the stream was more or less obstructed by ice, which have been utilized in special computation of the daily flow during the winter.

The Delaware and Hudson Canal now abandoned above High Falls, draws its water supply, for the section from High Falls to tide water at Eddyville, from Rondout Creek at the feeder dam



Discharge of Wallkill River at New Paltz, Ulster County, N. Y., 1903.

below High Falls. The flow in the canal through the level opposite Rosendale Gauging Station should therefore be added to the discharge of the stream istelf to obtain the total run-off from the drainage basin.

A gauging station has been maintained at Lock 6 at the foot of the Rosendale level for the purpose of determining the amount of flow in the canal. The discharge in the canal was determined from observations of the depth of flow over the wasteweir, of the number of lockages, and of the opening of the valves in the lock gates.

The accompanying tables show the estimated daily discharge of Rondout Creek at the gauging station, the daily diversion flowing in the Delaware and Hudson Canal, the mean monthly flow in each, and the total run-off from the watershed obtained by adding the flow in the stream channel and canal.

The drainage basin of Rondout Creek is mountainous and, with the exception of the broad valley in which the stream flows, it is largely wooded. The lower drainage basin is very narrow on the right-hand side, being separated from that of Wallkill River only by the Shawangunk Range.[a]

Current-meter Discharge Measurements of Rondout Creek, at Rosendale, N. Y. [h]

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1901.				
July	6	R. E. Horton & G. B. Hollister.	6.55	319
July	18	A. E. Place	6.29	118
August	6	A. E. Place	6.36	99
August	8	A. E. Place	7.46	745
August	15	A. E. Place	6.51	225
August	20	A. E. Place	6.90	526
August	28	A. E. Place	7.11	645
September	3	A. E. Place	7.78	1,200
September	4	A. E. Place	7.48	836
September	7	A. E. Place	6.83	427
September	24	W. W. Schlecht	6.38	140
October	7	W. W. Schlecht	6.50	218
October	11	W. W. Schlecht	6.37	163
October	11	G. B. Hollister	6.47	202
October	18	W. W. Schlecht	6.93	510
November	7	W. W. Schlecht	6.29	138
November	16	W. W. Schlecht	6.42	183
November	26	W. W. Schlecht	7.08	676
December	6	W. W. Schlecht	6.63	[b] 222
December	12	W. W. Schlecht	7.83	1,491
December	21	W. W. Schlecht	7.43	[c] 772
December	30	W. W. Schlecht	11.78	5,353

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[a] Water power and drainage basin of Rondout Creek are described in Report on Stream Gaugings contained in Supplement, Report of State Engineer and Surveyor of New York for 1903, pp. 271-277 inclusive. The gauge heights and discharge measurements there given are subject to a slight correction, owing to change of gauge datum.

[b] Ice 3 inches thick at station.

[c] Ice along bank at station.

[h] At this station great difficulty was experienced in securing good results by current-meter at low stages. The rating curve has accordingly been made to depend upon a large number of approximate measurements for such stages. All measurements are here tabulated. In deducing rating curves measurements departing from the mean curve beyond a limited percentage have been given reduced weight.

Current-meter Discharge Measurements of Rondout Creek, at Rosendale, N. Y.—(Concl'd).

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1902.			
January 7	W. W. Schlecht	7.14	710
January 14	W. W. Schlecht	6.83	423
January 25	W. W. Schlecht	7.66	1,371
January 30	W. W. Schlecht	8.00	*a* 943
February 8	W. W. Schlecht	8.61	*b* 1,185
February 18	W. W. Schlecht	7.50	*c* 342
February 26	W. W. Schlecht	7.93	*d* 543
February 26	W. W. Schlecht	8.23	*d* 684
March 1	W. W. Schlecht	17.38	*e* 13,936
March 21	W. W. Schlecht	7.85	1,529
April 10	W. W. Schlecht	11.60	5,665
April 28	W. W. Schlecht	6.65	382
May 12	W. W. Schlecht	6.70	421
June 6	W. W. Schlecht	6.27	163
June 20	W. W. Schlecht	6.31	166
July 15	H. K. Barrows	6.26	142
July 18	H. K. Barrows	6.26	137
July 29	H. K. Barrows	7.36	888
August 7	H. K. Barrows	7.39	838
August 29	H. K. Barrows	6.33	145
September 25	P. M. Churchill	6.37	167
November 4	F. H. Tillinghast	7.06	570
November 21	F. H. Tillinghast	6.61	283
December 2	F. H. Tillinghast	6.76	367
December 17	F. H. Tillinghast	12.86	7,928
1903.			
January 8	F. H. Tillinghast	7.71	1,122
February 3	F. H. Tillinghast	10.16	2,358
February 25	F. H. Tillinghast	7.96	*f* 676
March 4	F. H. Tillinghast	8.31	1,818
March 9	F. H. Tillinghast	10.61	4,638
April 9	F. H. Tillinghast	9.21	2,895
May 20	F. H. Tillinghast	6.19	95

Mean Daily Flow, Second-Feet, of Delaware and Hudson Canal at Rosendale, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	8.1	19.9	15.3	16.8	16.6	16.1	19.4	......	......
2	......	......	......	7.9	19.4	14.6	18.1	......	19.1	20.9	......	......
3	......	......	......	8.1	......	15.1	16.8	17.1	18.1	20.9	......	......
4	......	......	......	15.6	20.2	14.6	15.3	20.7	20.9	......	......	......
5	......	......	......	......	19.1	15.8	......	16.6	19.9	19.4	......	......
6	......	......	......	15.3	17.8	18.4	15.8	19.2	......	20.9	......	......
7	......	......	......	18.4	18.4	......	13.6	18.4	15.3	18.6	......	......
8	......	......	......	18.6	17.6	18.9	15.3	17.8	15.6	16.3	......	......
9	......	......	......	20.4	17.8	18.6	16.8	......	20.9	15.3	......	......
10	......	......	......	149.4	......	15.3	17.8	20.9	19.4	*f*	......	......
11	......	......	......	19.4	18.4	15.5	16.1	19.7	19.4	......	......	......
12	......	......	......	......	19.4	19.6	......	19.1	19.7	......	......	......
13	......	......	......	20.7	19.1	19.6	17.8	17.8	......	......	......	......
14	......	......	......	20.2	19.9	......	18.9	18.1	18.6	......	......	......
15	......	......	......	16.1	16.8	17.0	16.9	19.7	17.1	......	......	......
16	......	......	......	20.7	18.4	18.1	17.3	......	17.8	......	......	......
17	......	......	......	19.4	......	16.6	13.8	16.6	19.9	......	......	......
18	......	......	......	17.8	18.4	16.3	17.8	22.2	18.1	......	......	......
19	......	......	......	......	17.8	14.8	......	19.4	19.9	......	......	......
20	......	......	6.2	22.3	16.8	18.4	18.4	18.1	......	......	......	......
21	......	......	6.0	20.7	18.6	......	17.6	18.6	18.9	......	......	......
22	......	......	......	21.2	17.6	19.6	19.1	17.1	19.2	......	......	......
23	......	......	3.25	19.4	17.6	16.8	17.1	......	19.1	......	......	......
24	......	......	5.2	20.7	......	9.7	16.6	17.3	18.9	......	......	......
25	......	......	5.4	20.4	11.7	13.8	19.2	18.1	18.9	10.0	......	......
26	......	......	4.4	......	13.4	16.1	......	14.3	18.6	15.3	......	......
27	......	......	4.8	20.7	18.1	18.1	19.1	19.4	......	14.3	......	......
28	......	......	5.9	19.6	13.1	......	18.6	17.6	19.9	17.4	......	......
29	......	......	......	19.2	14.8	13.8	18.9	14.1	18.9	17.6	......	......
30	......	......	5.9	19.7	16.1	16.1	21.4	......	19.4	*g*	......	......
31	......	......	8.7	......	......	......	19.4	18.7	......	......	......	......
Mean	......	......	5.57	23.0	17.6	16.4	17.4	18.2	18.8	16.2	......	......

a Ice along banks. *b* Ice 0.06 to 0.2 feet thick. *c* Measurement uncertain. *d* Ice 0.5′ thick, anchor ice. *e* Made by floats. *f* Canal injured by flood. No record from October 10-24 inclusive. *g* Canal closed for season.

Mean Daily Discharge, Second-Feet, of Rondout Creek at Rosendale, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	......	......	......	......	......	......	......	359	1,021	678	182	185
2	......	......	......	......	......	......	......	214	1,151	384	182	132
3	......	......	......	......	......	......	......	142	1,202	446	182	168
4	......	......	......	......	......	......	......	124	1,011	353	164	340
5	......	......	......	......	......	......	......	96	842	290	146	353
6	......	......	......	......	......	......	......	160	478	247	146	340
7	......	......	......	......	......	......	......	3,365	415	210	146	384
8	......	......	......	......	......	......	224	807	353	210	146	434
9	......	......	......	......	......	......	188	465	290	203	146	566
10	......	......	......	......	......	......	135	278	246	175	146	2,573
11	......	......	......	......	......	......	118	661	246	168	136	2,629
12	......	......	......	......	......	......	135	868	278	168	164	1,525
13	......	......	......	......	......	......	153	434	322	192	428	1,051
14	......	......	......	......	......	......	164	234	228	669	334	2,323
15	......	......	......	......	......	......	153	214	203	1,101	225	12,903
16	......	......	......	......	......	......	182	220	269	781	217	4,223
17	......	......	......	......	......	......	153	214	290	540	199	2,302
18	......	......	......	......	......	......	440	359	528	478	199	1,715
19	......	......	......	......	......	......	253	764	403	415	199	1,071
20	......	......	......	......	......	......	218	484	278	353	182	868
21	......	......	......	......	......	......	214	2,226	221	309	146	868
22	......	......	......	......	......	......	178	1,588	210	290	128	885
23	......	......	......	......	......	......	188	936	192	290	146	1,251
24	......	......	......	......	......	......	171	2,496	175	228	182	1,051
25	......	......	......	......	......	......	171	2,944	168	228	945	583
26	......	......	......	......	......	......	153	1,535	149	228	643	508
27	......	......	......	......	......	......	214	911	139	228	440	434
28	......	......	......	......	......	......	196	634	132	259	378	695
29	......	......	......	......	......	......	178	484	528	192	334	2,464
30	......	......	......	......	......	......	328	868	833	192	334	6,182
31	......	......	......	......	......	......	359	340	......	192	......	3,496
Mean	......	......	......	......	......	......	203	820	427	345	252	1,758
1902.												
1	2,054	2,302	13,520	1,472	1,578	217	540	1,171	160	3,870	807	409
2	1,202	2,270	8,970	1,141	1,021	182	434	1,842	143	2,922	704	390
3	1,202	a1,885	6,223	885	1,021	207	478	1,071	118	1,989	618	515
4	1,202	1,550	3,138	885	1,071	241	1,101	781	125	1,432	592	764
5	1,202	1,840	1,978	687	842	182	652	609	107	1,332	515	503
6	1,121	1,467	1,302	600	687	153	592	756	135	2,367	503	453
7	885	1,271	1,202	902	643	182	496	825	143	1,535	549	549
8	a196	1,132	911	1,392	540	171	421	566	143	1,181	484	575
9	134	956	2,741	6,345	459	182	403	496	153	919	453	503
10	120	595	3,080	5,206	397	143	297	434	592	747	440	678
11	127	676	2,629	3,186	365	118	234	415	315	549	409	a214
12	233	595	3,080	2,507	365	135	214	478	214	3,472	409	178
13	77	552	4,712	1,789	334	135	203	415	234	2,226	409	155
14	18	485	3,616	1,442	241	143	185	353	378	1,535	390	247
15	35	442	2,464	1,141	217	135	150	259	253	1,111	390	414
16	61	357	2,086	945	259	135	168	278	196	893	390	1,905
17	18	297	7,471	816	210	188	143	228	160	790	359	7,654
18	15	334	3,377	712	217	171	132	210	143	704	359	3,773
19	18	219	1,926	600	210	118	143	192	135	661	378	2,388
20	15	251	1,504	502	210	164	937	192	160	618	359	1,852
21	18	251	1,322	490	200	164	2,248	185	265	549	359	1,905
22	b7,200	242	1,252	459	175	534	2,663	221	214	515	359	8,367
23	1,984	251	1,131	428	168	284	1,799	192	153	453	328	4,479
24	815	274	1,051	365	157	189	4,896	192	160	453	328	3,234
25	491	311	885	353	139	153	3,918	168	234	453	297	2,065
26	380	709	738	409	322	164	2,410	157	3,057	409	390	1,641
27	1,624	a2,730	678	397	365	189	1,641	150	3,472	347	421	2,464
28	1,051	a6,200	626	315	583	164	1,202	139	2,250	3,472	515	981
29	1,302	......	3,425	284	353	171	807	168	10,811	2,173	503	825
30	1,472	......	2,888	2,753	210	1,061	1,202	157	3,834	1,362	453	764
31	1,926	......	1,905	......	221	......	764	157	......	981	......	764
Mean	910	1,087	2,962	1,314	445	212	1,015	434	949	1,355	449	1,665

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a Taken from ice curve, January 8-27, inclusive.
Taken from ice curve, February 3-24, inclusive.
Taken from ice curve, February 27-28, inclusive.
Taken from ice curve, December 11-15, inclusive.

b Beyond limit of curve.

Mean Daily Discharge, Second-Feet, of Rondout Creek at Rosendale, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	704	3,712	6,921	1,641	272	75	1,852	203	2,697	192	490	......
2	721	3,413	3,080	1,181	241	68	1,091	160	1,810	174	478	......
3	1,131	4,076	2,248	1,041	224	57	661	139	1,272	174	465	......
4	2,226	3,724	1,821	1,292	241	75	515	234	971	174	478	......
5	1,662	3,532	1,873	1,111	272	132	415	5,258	781	174	465	......
6	1,131	2,065	1,694	893	241	50	328	3,057	609	174	583	......
7	807	1,535	1,620	807	217	45	309	3,496	465	192	490	......
8	1,031	1,181	2,442	1,382	217	45	210	2,086	446	192	......	......
9	721	981	4,626	2,674	200	221	175	1,578	415	18,130	......	......
10	790	764	3,532	1,884	182	146	178	1,121	415	17,740	......	......
11	893	807	4,871	1,392	182	168	157	540	403	4,500	......	......
12	1,332	3,712	3,604	1,151	168	5,466	157	712	340	2,930	......	......
13	1,747	2,550	2,640	954	164	3,377	150	484	303	2,160	......	......
14	2,280	2,173	2,119	911	146	1,652	139	390	290	1,580	......	......
15	2,388	1,483	1,747	2,065	153	3,210	132	322	259	1,320	......	......
16	2,442	1,282	1,483	1,821	164	2,507	128	322	228	1,120	......	......
17	*a* 836	*a*1,163	1,242	1,302	146	1,462	157	384	253	1,170	......	......
18	540	2,209	1,111	981	128	1,242	157	297	1,472	1,770	......	......
19	293	2,092	954	807	128	928	465	353	540	1,270	......	......
20	293	1,993	876	695	114	1,242	353	652	415	1,050	......	......
21	730	1,849	868	549	111	5,665	1,171	540	353	884	......	......
22	1,724	1,682	2,753	515	111	4,088	384	353	290	781	......	......
23	836	1,086	4,786	515	93	2,933	1,332	259	259	730	......	......
24	509	1,012	6,060	465	75	4,638	583	228	210	800	......	......
25	632	695	3,312	421	82	2,956	265	446	200	670	......	......
26	695	479	2,173	390	93	2,022	214	1,001	192	643	......	......
27	632	362	1,673	359	93	1,362	178	490	192	557	......	......
28	509	3,410	1,332	328	82	902	143	509	192	540	......	......
29	1,012	......	1,081	297	111	1,292	125	9,595	174	528	......	......
30	2,254	......	945	265	93	2,550	309	5,895	592	508	......	......
31	4,320	......	2,753	......	75	......	278	4,626	......	528	......	......
Mean	1,220	1,965	2,524	1,003	155	1,686	410	1,475	554	2,044	492	......

Estimated Monthly Discharge of Rondout Creek, at Rosendale, N. Y.
[Drainage area, 380 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			Diversion to canal second-feet.	Total second-feet.	YIELD OF DRAINAGE AREA.	
	Maximum.	Minimum.	Mean.			Second-feet per square mile.	Depth in inches.
1901.							
January	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....
April	....	....	....	....	....	....	....
May	....	....	....	....	....	....	....
June	....	....	....	....	....	....	....
July	440	118	203	*b*	223	.586	.68
August	3,365	96	820	*b*	840	2.209	2.55
September	1,202	132	427	*b*	447	1.176	1.32
October	1,101	168	345	20	365	.960	1.11
November	945	128	252	19	271	.712	.79
December	12,903	132	1,758	....	1,758	4.624	5.33

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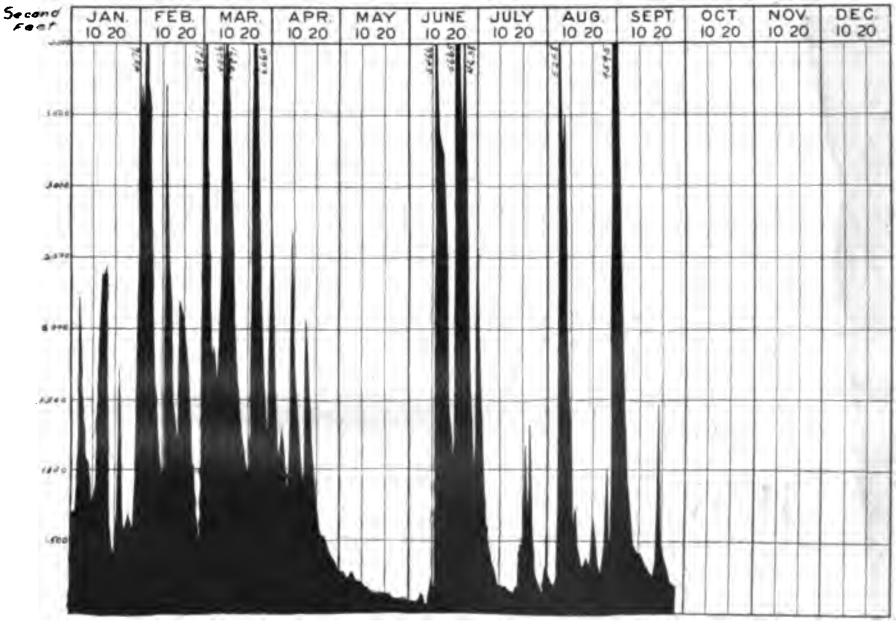
a Taken from ice curve, January 17-30, inclusive.
a Taken from ice curve, February 17-28, inclusive.
b No record. Assumed diversion 20 C. F. S.



Discharge of Rondout Creek at Rosendale, Ulster County, N. Y., 1903.

Estimated Monthly Discharge of Rondout Creek, at Rosendale, N. Y.—(Concluded).

MONTH.	DISCHARGE IN SECOND-FEET.			Diversion to canal second-feet.	Total second-feet.	YIELD OF DRAINAGE AREA.	
	Maximum.	Minimum.	Mean.			Second-feet per square mile.	Depth in inches.
1902.							
January	7,200	15	910	....	910	2.393	2.76
February	6,200	219	1,087	....	1,087	2.859	2.97
March	13,520	626	2,962	*a* 18.0	2,967	7.803	8.97
April	6,345	284	1,314	22.5	1,336	3.514	3.92
May	1,578	139	445	24.0	469	1.233	1.42
June	1,061	118	212	23.7	236	.621	.69
July	4,896	132	1,015	23.8	1,039	2.732	3.15
August	1,842	139	434	24.3	458	1.204	1.38
September	10,811	107	949	24.0	973	2.558	2.86
October	3,870	347	1,355	22.2	1,377	3.621	4.17
November	807	297	449	18.2	467	1.228	1.36
December	8,367	155	1,665	*b* 21.8	1,669	4.389	5.04
1903.							
January	4,820	293	1,220	....	1,220	3.209	3.70
February	4,076	362	1,965	....	1,965	5.168	5.37
March	6,921	868	2,524	*c* 5.6	2,526	6.638	7.65
April	2,674	265	1,003	23.0	1,026	2.638	2.95
May	272	75	155	17.6	173	.408	.47
June	5,665	45	1,686	16.4	1,702	4.434	4.95
July	1,852	125	410	17.4	427	1.078	1.25
August	9,595	139	1,475	18.2	1,493	3.879	4.47
September	2,697	192	554	18.8	572	1,504	1.67
October	3,130	192	2,044	16.2	2,060	5,418	6.24
November 1-7	583	465	492	....	492	1,294	1.44

a March 23 to 31 inclusive.
b December 1 to 6 inclusive.
c March 20 to 31.

ESOPUS CREEK AT KINGSTON, ULSTER COUNTY, N. Y.

A gauging station was established at the Washington Street Bridge on Esopus Creek in Kingston, N. Y., July 5, 1901. The stage of the stream has been observed each morning and night from a chain and weight gauge attached to the bridge. In addition, numerous current-meter discharge measurements have been made, the results of which, including a slight correction to the gauge heights to reduce them to a common datum, are given in the accompanying table.

In winter and at times when the stream was more or less obstructed by ice, special discharge measurements were made from which a rating curve applicable to periods when the stream was frozen have been derived. This gives a considerably smaller discharge at a given stage of the stream than does a regular rating curve for the cross-section derived from the measurements in open section.

The gauge datum is referred to a bench mark on the corner of the upstream side of the right-hand abutment.

Assumed elevation of bench mark..........................	100.00
Gauge datum elevation..............................	68.26

Owing to gradual change in the length of the gauge chain, the gauge heights as heretofore published required a slight correction to reduce them to this datum.

A portion of the drainage basin of Esopus Creek is shown on the Phoenicia sheet, No. 176, U. S. Geol. Survey Topographic map. The region is mountainous, the ridges rising to elevation 2,500 to 3,500 feet above tide. The stream flows in a broad shallow channel and is subject to frequent freshets; the run-off from the adjacent hill slopes being carried rapidly to the main stream channel through the numerous tributary valleys.[a]

Current-meter Discharge Measurements of Esopus Creek at Kingston, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge second-feet.
1901.			
July 5	R. E. Horton and G. B. Hollister	4.31	148
July 18	A. E. Place	4.09	145
July 19	A. E. Place	4.39	173
July 22	A. E. Place	3.79	64
August 5	A. E. Place	3.87	86
August 8	A. E. Place	6.92	326
August 10	A. E. Place	4.82	239
August 19	G. B. Hollister and A. E. Place	4.57	180
August 27	A. E. Place	6.24	728
August 29	A. E. Place	5.47	364
September 4	A. E. Place	6.075	554
September 6	A. E. Place	5.42	352
September 21	W. W. Schlecht	4.74	200
September 26	W. W. Schlecht	4.51	168
September 26	W. W. Schlecht	4.51	150
October 3	W. W. Schlecht	5.20	329
October 8	W. W. Schlecht	4.64	178
October 10	W. W. Schlecht	4.56	166
October 10	G. B. Hollister	4.56	188
October 16	W. W. Schlecht	6.58	785
October 21	W. W. Schlecht	5.50	381
November 1	W. W. Schlecht	4.66	184
November 14	W. W. Schlecht	4.67	195
November 18	W. W. Schlecht	4.37	126
November 26	W. W. Schlecht	4.98	245
December 4	W. W. Schlecht	4.19	236
December 11	W. W. Schlecht	11.87	1,721
December 19	W. W. Schlecht	8.26	1,472
December 30	W. W. Schlecht	12.06	b8,989

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[a] Water power on this stream is described in Report on Stream Gaugings contained in Supplement, Report of State Engineer and Surveyor of New York for 1902, pp. 264-270, inclusive.

[b] Ice jam below bridge.

Current-meter Discharge Measurements of Esopus Creek at Kingston, N. Y.—(Concluded).

DATE.		Hydrographer.	Gauge height, feet.	Discharge second-feet.
	1902.			
January	9	W. W. Schlecht	6.43	522
January	22	W. W. Schlecht	16.09	6,747
January	22	W. W. Schlecht	15.89	5,333
January	27	W. W. Schlecht	9.59	2,761
January	29	W. W. Schlecht	7.62	1,149
February	7	W. W. Schlecht	6.70	*a*580
February	15	W. W. Schlecht	5.47	*a*337
February	20	W. W. Schlecht	5.25	*a*245
February	28	W. W Schlecht	9.01	1,687
March	1	W. W. Schlecht	20.24	12,620
March	12	R. E. Horton, W. W. Schlecht	9.76	2,843
April	10	W. W. Schlecht	13.21	5,021
April	23	W. W. Schlecht	6.78	828
April	30	W. W. Schlecht	10.12	2,813
May	14	W. W. Schlecht	5.65	422
May	14	W. W. Schlecht	7.96	*d*506
May	24	W. W. Schlecht	6.20	*d*274
May	24	W. W. Schlecht	4.84	225
June	5	W. W. Schlecht	6.22	*d*271
June	5	W. W. Schlecht	4.84	234
June	16	W. W. Schlecht	4.29	186
June	26	W. W. Schlecht	4.79	231
July	9	H. K. Barrows, W. W. Schlecht	5.66	450
July	16	H. K. Barrows	4.98	269
July	24	H. K. Barrows	7.96	1,348
July	30	H. K. Barrows	7.50	1,155
August	12	H. K. Barrows	6.09	550
August	21	H. K. Barrows	4.75	191
September	4	H. K. Barrows	4.27	183
September	23	P. M. Churchill	5.65	449
October	4	P. M. Churchill	9.07	1,890
November	5	F. H. Tillinghast	6.27	594
November	11	F. H. Tillinghast	5.72	416
November	22	F. H. Tillinghast	5.17	272
December	11	F. H. Tillinghast	6.80	*b*476
December	18	F. H. Tillinghast	12.70	3,461
December	22	F. H. Tillinghast	15.70	3,594
	1903.			
January	14	F. H. Tillinghast	6.60	*c*425
February	6	F. H. Tillinghast	9.20	2,141
February	24	F. H. Tillinghast	6.80	654
March	2	F. H. Tillinghast	11.33	3,330
April	29	F. H. Tillinghast	5.42	365
May	21	F. H. Tillinghast	4.85	183
July	22	F. H. Tillinghast	5.17	316
September	4	F. H. Tillinghast	7.66	1,181

a Ice above and below bridge.
b Ice 1.0′ thick at station.
c Ice 7 inches thick at station.
d At Glasgow Bridge, Glen Erie.

Mean Daily Discharge, Second-Feet, of Esopus Creek at Kingston, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	......	......	......	......	......	......	......	70	678	155	170	162
2	......	......	......	......	......	......	......	66	617	174	152	150
3	......	......	......	......	......	......	......	59	757	188	122	198
4	......	......	......	......	......	......	......	244	610	155	127	348
5	......	......	......	......	......	......	125	66	458	138	155	168
6	......	......	......	......	......	......	133	31	394	117	143	178
7	......	......	......	......	......	......	125	66	356	147	160	188
8	......	......	......	......	......	......	142	893	258	164	143	172
9	......	......	......	......	......	......	142	441	294	150	118	......
10	......	......	......	......	......	......	117	297	242	155	118	*a*300
11	......	......	......	......	......	......	117	265	258	147	138	3,809
12	......	......	......	......	......	......	125	230	228	133	160	2,378
13	......	......	......	......	......	......	125	200	232	150	164	1,022
14	......	......	......	......	......	......	108	174	228	155	138	1,395
15	......	......	......	......	......	......	69	143	198	164	127	16,122
16	......	......	......	......	......	......	108	143	202	178	135	7,426
17	......	......	......	......	......	......	84	135	252	147	114	2,999
18	......	......	......	......	......	......	84	164	319	138	127	1,916
19	......	......	......	......	......	......	178	155	270	168	152	1,378
20	......	......	......	......	......	......	100	210	336	204	147	1,329
21	......	......	......	......	......	......	92	504	294	204	143	1,208
22	......	......	......	......	......	......	62	741	208	184	152	954
23	......	......	......	......	......	......	84	498	238	184	138	806
24	......	......	......	......	......	......	76	1,049	208	174	152	745
25	......	......	......	......	......	......	62	1,203	153	174	170	669
26	......	......	......	......	......	......	73	700	133	155	164	617
27	......	......	......	......	......	......	66	527	153	138	160	582
28	......	......	......	......	......	......	55	484	198	142	200	501
29	......	......	......	......	......	......	37	441	145	164	351	1,112
30	......	......	......	......	......	......	108	363	142	147	152	3,944
31	......	......	......	......	......	......	117	309	......	168	......	2,181
Mean	......	......	......	......	......	......	100	350	302	160	153	1,832
1902.												
1	1,421	959	13,844	2,067	1.802	192	607	864	115	5,431	905	412
2	2,827	1,049	9,290	1,658	1,378	188	541	1,256	120	3,827	614	358
3	*a*2,210	2,087	7,961	1,320	1,179	174	469	868	112	2,532	397	495
4	1,287	1,169	3,874	1,121	1,140	188	614	786	95	1,960	620	572
5	970	1,076	2,148	982	1,018	162	481	645	104	1,560	620	537
6	780	*a* 715	1,826	852	885	168	541	860	95	2,201	518	492
7	650	563	1,256	914	823	137	530	786	104	1,603	607	544
8	585	495	1,149	959	725	150	490	610	104	1,339	551	631
9	510	411	1,766	5,245	655	150	426	521	104	1,179	484	579
10	485	438	1,980	5,986	603	158	366	438	1,112	973	446	441
11	470	2,185	1,886	3,836	544	142	346	423	463	864	1,164	*a*422
12	855	352	2,392	2,735	504	120	307	548	326	1,850	432	472
13	383	582	4,088	2,108	458	133	250	395	336	1,485	403	422
14	367	292	4,043	1,712	441	142	240	356	515	1,252	383	433
15	295	287	2,525	1,421	389	112	226	307	420	1,063	371	443
16	291	277	2,067	1,247	389	122	228	287	336	941	346	500
17	293	297	12,064	1,094	339	178	208	238	280	864	339	5,700
18	228	248	5,265	991	297	210	190	242	242	782	339	3,950
19	93	260	2,635	880	309	150	186	218	232	700	324	2,840
20	245	232	1,980	811	312	145	607	218	280	694	304	2,082
21	168	240	1,624	757	285	184	2,532	198	766	607	302	1,507
22	4,000	240	1,432	811	250	349	2,175	192	548	544	285	7,628
23	3,252	232	1,295	790	230	248	2,027	178	429	513	280	4,810
24	1,802	240	1,237	790	224	208	1,496	145	373	492	280	2,720
25	1,320	248	1,126	672	200	184	1,603	162	373	478	244	1.974
26	1,094	490	1,036	596	265	216	1,658	153	815	420	265	1,587
27	1,652	1,783	968	593	265	260	1,305	137	2,743	391	446	1,363
28	1,358	1,820	928	541	358	198	1,179	153	2,114	1,174	638	1,613
29	914	......	3,899	475	277	192	923	162	17,800	1,426	475	*a*1,565
30	1,232	......	4,725	2,385	230	885	1,145	145	9,856	1,130	412	1,490
31	1,072	......	2,890	......	230	......	995	150	......	1,031	......	1,012
Mean	1,052	688	3,377	1,545	548	201	803	408	1,377	1,332	460	1,600

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a Taken from ice curve, 3d to 22d January inclusive.
a Taken from ice curve, 6th to 28th February inclusive.
a Taken from ice curve, 11th to 20th December inclusive.
a Taken from ice curve, 29th to 31st December inclusive.

Mean Daily Discharge, Second-Feet, of Esopus Creek, at Kingston, N. Y. —(Concluded).

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	*a*745	1,680	9,142	1,742	371	52	1,121	190	3,368	220	498	481
2	700	1,350	3,665	1,507	309	85	884	160	2,174	208	492	452
3	1,392	1,640	2,312	1,400	302	77	693	146	1,544	196	452	472
4	1,712	2,720	1,802	1,384	351	70	589	214	1,178	180	469	394
5	1,000	2,913	1,587	1,227	309	67	527	1,400	972	160	434	400
6	845	2,007	1,480	1,072	290	59	400	1,140	790	196	521	386
7	705	1,565	1,334	1,018	277	63	418	1,168	648	184	455	400
8	720	1,300	1,426	1,121	272	63	344	823	589	406	418	373
9	922	1,130	3,503	1,790	240	170	322	624	515	18,730	434	348
10	682	995	3,800	1,802	230	135	284	617	484	14,750	412	472
11	605	905	3,683	1,517	230	146	260	475	446	6,080	397	386
12	705	2,591	3,638	1,310	214	5,548	220	530	418	5,060	383	242
13	615	1,974	2,605	1,140	180	4,358	224	452	338	2,390	383	554
14	596	1,688	2,074	1,063	180	1,928	216	371	346	2,070	397	3,030
15	618	1,378	1,940	1,247	200	2,913	190	338	304	1,700	338	2,360
16	605	1,252	1,629	1,324	174	2,583	192	309	290	1,540	368	1,840
17	557	*a*2,005	1,400	1,164	152	1,868	184	394	322	1,320	1,090	1,710
18	487	1,713	1,252	995	160	1,522	160	328	1,040	1,580	1,830	1,590
19	362	1,690	1,164	885	146	1,276	252	294	541	1,180	1,450	1,210
20	274	1,045	1,179	811	135	1,085	397	1,202	434	1,040	1,170	1,330
21	473	940	1,252	741	135	4,697	397	950	414	972	1,170	8,660
22	1,292	837	3,665	665	110	3,836	280	624	334	872	896	4,720
23	1,012	645	5,008	631	110	2,913	458	534	314	844	856	3,350
24	618	645	9,452	579	110	5,028	378	498	290	884	864	2,870
25	572	530	4,688	513	73	3,485	297	397	256	884	742	2,500
26	557	472	2,658	490	102	2,282	220	554	256	742	630	2,190
27	557	454	2,658	484	89	1,592	204	440	236	700	644	1,410
28	618	3,710	1,560	418	85	1,183	196	423	244	558	589	1,670
29	910	......	1,310	397	97	1,130	176	6,200	224	638	544	1,230
30	1,803	......	1,130	371	85	1,517	180	6,950	216	596	527	1,180
31	2,200	......	2,422	......	80	......	212	6,163	......	575	......	1,210
Mean	823	1,492	2,788	1,027	187	1,724	351	1,126	651	2,176	663	1,594

Estimated Monthly Discharge of Esopus Creek, at Kingston, N. Y.

[Drainage area, 324.5 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1901.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	....	....	....	....	....
June	....	....	....	....	....
July	178	36	100	.308	.36
August	1,202	31	350	1.078	1.25
September	757	133	302	.930	1.04
October	204	116	160	.493	.56
November	351	113	153	.471	.52
December	16,122	150	1,832	5.64	6.50

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a Taken from ice curve, January 1 to February 3 inclusive.
a Taken from ice curve, February 17 to February 27 inclusive.

Estimated Monthly Discharge of Esopus Creek, at Kingston, N. Y.—(Concluded).

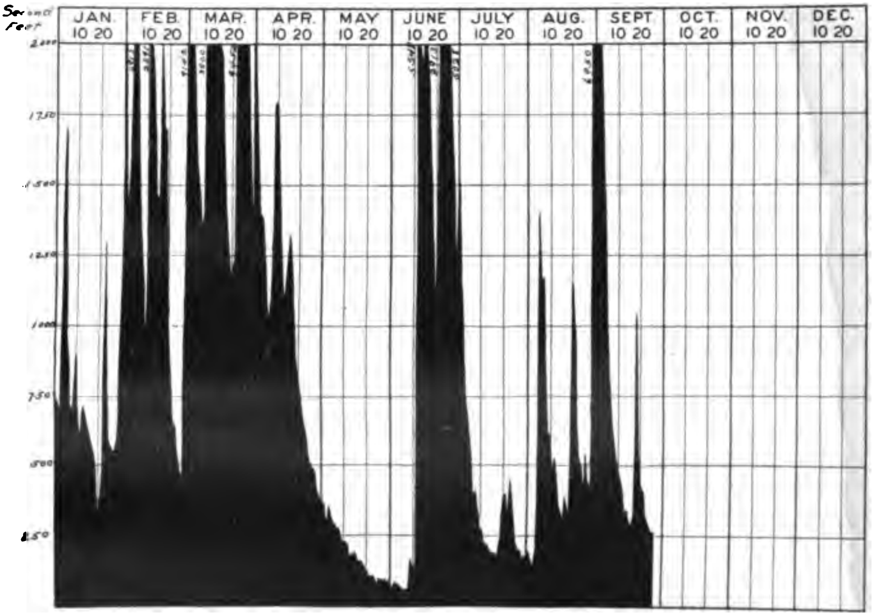
MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1902.					
January	4,000	93	1,052	3.24	3.74
February	2,185	232	688	2.119	2.20
March	13,844	928	3,377	10.401	11.99
April	5,986	475	1,545	4.759	5.31
May	1,802	200	548	1.688	1.95
June	885	112	201	.619	.69
July	2,532	186	803	2.473	2.85
August	1,256	137	408	1.256	1.45
September	17,800	95	1,377	4.241	4.73
October	5,481	391	1,332	4.102	4.73
November	1,164	244	460	1.416	1.58
December	7,628	358	1,600	4.928	5.68
1903.					
January	2,200	274	823	2.534	2.92
February	3,710	454	1,492	4.595	4.78
March	9,452	1,130	2,788	8.587	9.90
April	1,802	371	1,027	3.163	3.53
May	371	73	187	.575	.67
June	5,548	52	1,724	5.309	5.92
July	1,121	160	351	1.081	1.25
August	6,950	146	1,126	3.468	4.00
September	3,368	216	651	2.02	2.25
October	18,730	184	2,176	6.745	7.77
November	1,830	338	663	2.060	2.30
December	8,660	242	1,594	4.941	5.69

ESOPUS CREEK AT OLIVE BRIDGE, ULSTER COUNTY, N. Y.

A seven-eighths inch wire cable, 168 feet span, was erected across the stream 300 feet upstream from Bishop's Falls May 25, 1903. A cantilever was also projected 18 feet over the stream from an abandoned bridge abutment. Upon this a weight and chain gauge was placed. The stream stage is observed each morning and night by Jesse B. Boice.

Current-meter measurements, made from a car travelling on the cableway, by F. H. Tillinghast, are given herewith.

This gauging station is located near the site of a proposed storage reservoir. The bed of the stream is rock and the banks bold. No overflow takes place. The gauging station is in the heart of a precipitous timber-covered mountain drainage basin. There is no storage control of the stream above. The bench mark is a chisel draft on upstream corner of the right-hand abutment of the abandoned bridge. The elevation of water surface when gauge reads zero is 81.86.



Discharge of Esopus Creek at Kingston, Ulster County, N. Y., 1903.

Current-meter Discharge Measurements of Esopus Creek, at Olive Bridge, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-feet.
	1908.			
June	2	F. H. Tillinghast	1.1	75
June	2	F. H. Tillinghast	1.05	60.5
June	11	F. H. Tillinghast	1.13	90.0
June	13	F. H. Tillinghast	3.08	1,828
June	17	F. H. Tillinghast	2.67	1,290
July	2	F. H. Tillinghast	2.14	635
July	4	F. H. Tillinghast	1.92	428
July	9	F. H. Tillinghast	1.60	229
July	15	F. H. Tillinghast	1.30	145
August	11	F. H. Tillinghast	1.70	340
August	14	F. H. Tillinghast	1.62	270
August	29	F. H. Tillinghast	5.55	7,601
September	2	F. H. Tillinghast	2.74	1,345
September	8	F. H. Tillinghast	1.81	396
October	10	F. H. Tillinghast	5.70	7,682
October	10	F. H. Tillinghast	5.05	5,558
October	11	F. H. Tillinghast	4.05	3,350
October	11	F. H. Tillinghast	3.78	2,861

Mean Daily Gauge Height, feet, of Esopus Creek, at Olive Bridge, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1						1.02	2.30	1.26	3.19	1.24	1.68	1.71
2						1.05	2.10	1.21	2.78	1.22	1.67	1.70
3						1.04	1.94	1.19	2.46	1.22	1.66	1.64
4						.96	1.90	1.35	2.28	1.16	1.64	1.71
5						.97	1.84	2.60	2.10	1.22	1.80	1.80
6						.97	1.74	2.15	1.98	1.23	1.71	1.71
7						.99	1.68	2.18	1.88	1.19	1.56	1.52
8						1.24	1.61	1.93	1.78	2.38	1.62	1.51
9						1.34	1.58	1.82	1.72	10.89	1.62	1.50
10						1.11	1.54	1.78	1.66	5.70	1.62	1.55
11						1.26	1.48	1.68	1.58	3.96	1.60	1.62
12						4.35	1.43	1.80	1.55	3.28	1.59	1.68
13						3.40	1.44	1.64	1.54	2.82	1.56	2.79
14						2.98	1.54	1.58	1.50	2.55	1.54	2.08
15						3.40	1.31	1.52	1.45	2.42	1.54	1.88
16						3.10	1.28	1.57	1.41	2.22	1.58	1.88
17						2.72	1.18	1.56	1.95	2.14	2.28	1.84
18						2.50	1.12	1.50	2.02	2.34	2.55	1.78
19						2.30	1.50	1.44	1.71	2.18	2.34	1.68
20						2.34	1.36	2.55	1.60	2.15	2.16	2.90
21						3.96	1.58	2.12	1.54	2.08	2.06	3.06
22						3.38	1.42	1.90	1.50	2.02	2.04	2.85
23						3.35	1.78	1.84	1.48	2.02	2.01	2.47
24						4.10	1.52	1.79	1.42	1.99	1.97	2.31
25					1.15	3.40	1.40	1.76	1.39	1.98	1.89	2.30
26					1.10	2.85	1.34	1.80	1.36	1.81	1.77	2.31
27					1.02	2.55	1.29	1.68	1.36	1.78	1.74	1.94
28					1.07	2.28	1.27	1.82	1.38	1.76	1.76	1.92
29					1.05	2.56	1.21	5.72	1.32	1.75	1.66	1.82
30					1.05	2.42	1.32	4.38	1.28	1.74	1.72	1.89
31					1.05		1.33	4.22		1.69		1.83

CATSKILL CREEK AT SOUTH CAIRO, GREENE COUNTY, N. Y.

This gauging station, which was established July 4, 1901, is located at the highway bridge in the Village of South Cairo. The bridge has a single span of 194.5 feet between abutments.

The stream channel is of rock, overlaid with earth in some places. The stream stage is observed each morning and night by C. J. Abrams from a weight and chain gauge attached to the bridge, and having its datum referred to an " O " near outer corner upstream side of bridge seat on right-hand abutment. Elevation of Bench mark assumed 100.00. Elevation of water surface when gauge reads zero, 78.71.

Special discharge measurements have been made in the winter to determine the calibration curve for the stream cross section in the presence of ice; a correction coefficient to be applied to the measured discharge as taken at 0.6 depth has also been obtained by means of numerous vertical velocity curves. The corrected discharge measurements are given in the accompanying table.

The drainage basin of this stream receives the run-off from the north slope of the Catskill Range, and lies, for the most part, in the timbered highlands of Greene County. The stream enters tide water of Hudson River at Catskill. From Kaaterskill Creek to Leeds, a distance of three miles, it flows through a gorge formed of tilted strata of bluestone, affording within this distance a fall of 180 feet. The topography of the drainage areas is shown on the Durham, Coxsackie and Catskill Atlas sheets Nos. 191, 209 and 210 of the United States Geological Survey. The stream flows over a rock bed through much of its course. The slopes of the drainage basin are precipitous and there are no lakes, and little artificial storage.[a]

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[a] Water power of this stream is described in Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor of New York for 1902, pp. 260 to 264.

Current-meter Discharge Measurements of Catskill Creek, at South Cairo, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-feet.
	1901.			
July	4	R. E. Horton G. B. Hollister	2.75	62.73
July	17	H. A. Pressey A. E. Place	3.85	268.10
July	20	A. E. Place	3.60	316.67
July	25	A. E. Place	3.00	84.36
August	1	A. E. Place	2.8	49.34
August	9	A. E. Place	3.0	84.03
August	19	G. B. Hollister A. E. Place	2.7	40.73
August	27	A. E. Place	3.12	120.30
September	2	A. E. Place	3.0	89.60
September	7	A. E. Place	2.92	70.85
September	23	W. W. Schlecht	2.735	36.67
October	4	W. W. Schlecht	2.70	26.37
October	10	G. B. Hollister W. W. Schlecht	2.58	24.00
October	22	W. W. Schlecht	2.82	55.83
November	8	W. W. Schlecht	2.70	28.43
November	19	W. W. Schlecht	2.75	43.57
December	9	W. W. Schlecht	3.30	112.78
	1902.			
January	15	W. W. Schlecht	3.50	*a*152.84
February	27	W. W. Schlecht	4.72	*b*363
March	13	R. E. Horton W. W. Schlecht	8.66	5,647.49
April	11	W. W. Schlecht	6.86	2,381.36
April	22	W. W. Schlecht	4.06	329.81
May	10	W. W. Schlecht	3.47	137.00
May	23	W. W. Schlecht	2.83	52.63
June	3	W. W. Schlecht	2.82	50.98
June	13	W. W. Schlecht	2.69	41.82
June	24	W. W. Schlecht	2.70	44.80
July	9	H. K. Barrows	3.365	116.90
July	23	H. K. Barrows	6.11	1,650.06
August	2	H. K. Barrows	5.36	1,035.15
August	13	H. K. Barrows	3.49	139.05
August	27	H. K. Barrows	2.74	40.58
September	5	H. K. Barrows	2.79	51.50
September	22	P. M. Churchill	3.32	124.63
October	10	P. M. Churchill	3.96	249.26
November	7	F. H. Tillinghast	3.8	242.05
November	17	F. H. Tillinghast	3.4	143.17
December	3	F. H. Tillinghast	3.9	283.56
December	18	F. H. Tillinghast	5.45	1,085.62
	1903.			
January	12	F. H. Tillinghast	3.62	167.89
February	20	F. H. Tillinghast	3.69	213.21
March	3	F. H. Tillinghast	4.75	662.29
March	12	F. H. Tillinghast	5.98	1,494.53
March	28	F. H. Tillinghast	4.70	664.35
April	24	F. H. Tillinghast	3.90	285.31
May	22	F. H. Tillinghast	2.50	86.36
June	3	F. H. Tillinghast	2.30	17.20
July	17	F. H. Tillinghast	2.60	46.3
August	12	F. H. Tillinghast	2.99	91.8
August	27	F. H. Tillinghast	3.12	120.0
September	9	F. H. Tillinghast	3.31	151.0

a Ice 0.1′ to 1.0′ thick.
b Ice 0.5′ to 1.5′ thick.

Mean Daily Discharge, Second-Feet, of Catskill Creek, at South Cairo, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	......	......	......	......	......	......	......	33	65	55	46	42
2	......	......	......	......	......	......	......	37	72	50	46	42
3	......	......	......	......	......	......	......	33	107	46	42	42
4	......	......	......	......	......	......	50	24	117	46	44	120
5	......	......	......	......	......	......	63	24	80	44	44	120
6	......	......	......	......	......	......	120	29	65	44	42	123
7	......	......	......	......	......	......	182	128	62	39	46	125
8	......	......	......	......	......	......	188	80	63	42	46	120
9	......	......	......	......	......	......	128	62	62	37	42	128
10	......	......	......	......	......	......	85	57	56	42	42	1,037
11	......	......	......	......	......	......	158	53	55	37	42	613
12	......	......	......	......	......	......	144	42	50	37	44	522
13	......	......	......	......	......	......	107	33	53	42	55	289
14	......	......	......	......	......	......	72	29	48	55	75	2,495
15	......	......	......	......	......	......	59	29	46	88	59	[a]26,600
16	......	......	......	......	......	......	63	29	50	96	56	1,206
17	......	......	......	......	......	......	258	24	56	75	53	824
18	......	......	......	......	......	......	237	30	70	70	50	498
19	......	......	......	......	......	......	473	39	70	63	50	304
20	......	......	......	......	......	......	176	44	56	59	50	258
21	......	......	......	......	......	......	101	50	55	56	50	274
22	......	......	......	......	......	......	44	80	55	55	50	304
23	......	......	......	......	......	......	68	107	53	55	46	304
24	......	......	......	......	......	......	72	144	48	55	46	343
25	......	......	......	......	......	......	70	167	44	55	46	144
26	......	......	......	......	......	......	56	104	42	55	46	136
27	......	......	......	......	......	......	46	68	42	50	42	136
28	......	......	......	......	......	......	46	55	46	50	42	152
29	......	......	......	......	......	......	48	46	55	50	42	258
30	......	......	......	......	......	......	42	42	56	46	42	546
31	......	......	......	......	......	......	37	37	......	46	......	498
Mean	......	......	......	......	......	......	114	57	60	53	48	1,245
1902.												
1	425	449	18,600	1,067	352	68	149	540	63	1,691	449	182
2	352	[b]839	8,823	1,426	289	62	117	1,191	57	1,230	377	191
3	410	914	2,217	796	280	55	91	488	50	946	328	243
4	498	495	2,328	691	268	56	98	362	49	712	288	891
5	498	464	2,106	915	249	62	85	258	49	602	274	304
6	401	456	1,067	630	237	62	522	522	46	563	252	804
7	328	382	852	498	219	59	401	401	49	498	237	283
8	712	374	852	602	213	63	280	280	53	415	222	243
9	213	346	449	18,300	182	55	243	243	63	328	198	213
10	167	360	946	4,675	152	50	198	198	207	274	167	328
11	136	713	1,824	2,528	136	46	182	167	167	283	152	498
12	120	444	6,854	1,976	120	42	167	167	117	874	167	367
13	120	523	6,272	1,128	117	53	68	144	136	602	192	304
14	120	407	3,230	796	107	50	56	96	161	425	161	304
15	104	67	1,098	702	104	46	55	104	128	377	152	289
16	120	77	3,094	590	80	50	50	96	101	319	136	563
17	104	99	7,826	473	72	63	46	80	80	283	136	1,853
18	72	102	2,384	425	289	62	42	65	68	252	125	1,085
19	63	126	877	401	63	53	46	96	70	248	120	824
20	63	164	546	401	68	59	498	88	112	252	117	712
21	88	160	304	362	68	55	2,890	75	149	222	120	2,051
22	9,459	156	574	352	56	55	1,995	70	123	207	104	5,059
23	1,442	95	1,191	314	53	55	2,017	65	101	182	104	2,217
24	712	63	1,116	289	63	53	1,691	56	88	192	96	908
25	498	81	854	274	68	46	2,659	50	112	182	104	741
26	314	87	780	243	59	44	3,026	46	176	152	120	2,051
27	258	404	724	249	88	42	328	46	473	167	258	473
28	176	3,787	933	219	123	37	401	48	657	1,465	367	401
29	213	......	1,300	289	112	55	498	59	1,948	1,006	243	367
30	425	......	1,457	352	93	268	488	70	2,822	657	191	289
31	449	......	1,067	......	72	......	425	85	......	522	......	258
Mean	615	451	2,598	1,398	144	61	639	202	283	520	199	784

[a] Dam said to have failed above, causing freshet.
[b] Taken from ice curve, February 2-28 inclusive.

Mean Daily Discharge, Second-Feet, of Catskill Creek, at South Cairo, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	228	546	2,645	1,324	99	18	376	44	1,363	32	206	120
2	252	449	1,006	854	88	18	258	42	796	32	176	120
3	473	459	685	712	83	18	176	35	574	32	167	115
4	885	1,067	657	685	72	18	139	35	410	28	152	104
5	629	915	602	546	72	18	91	198	314	28	218	104
6	459	512	574	522	68	18	115	249	249	32	263	104
7	343	425	685	483	63	18	80	188	182	32	228	104
8	304	304	1,128	602	59	25	82	139	148	90	176	104
9	182	274	2,495	1,006	55	22	69	101	132	*a*	162	104
10	152	258	1,758	657	52	20	64	88	107	13,700	152	104
11	152	295	3,230	522	46	21	44	72	101	3,160	144	88
12	182	1,285	1,663	425	46	1,442	42	70	88	1,948	136	88
13	144	674	2,051	401	46	1,167	40	65	72	1,324	136	328
14	144	459	946	449	46	522	35	52	65	1,006	136	546
15	152	377	780	1,402	46	1,167	34	47	63	812	132	400
16	141	319	685	1,663	42	1,006	29	46	54	701	120	243
17	152	213	557	930	37	546	61	42	75	657	766	243
18	125	158	507	629	37	473	32	37	128	766	629	212
19	85	222	449	522	37	328	46	37	101	612	462	152
20	109	182	449	425	33	376	47	120	70	556	411	1,760
21	401	222	401	362	29	2,686	50	67	56	506	297	1,520
22	657	198	2,162	314	29	1,805	46	56	54	449	263	601
23	522	131	6,692	289	26	1,418	46	50	50	440	243	590
24	522	152	3,353	289	24	3,094	46	42	46	440	288	473
25	367	131	1,442	243	24	1,442	37	48	42	381	222	497
26	182	123	976	213	24	915	32	128	37	360	162	449
27	176	112	602	167	24	602	28	104	37	297	148	573
28	192	3,758	602	139	30	425	26	88	37	274	131	590
29	377	......	574	131	20	449	28	1,363	32	258	120	546
30	1,615	......	507	112	20	498	44	3,406	32	243	120	546
31	741	......	2,754	......	18	......	54	3,230	32	243	......	546
Mean	356	508	1,407	567	45	686	74	332	183	748	232	390

a Above rating table.

Estimated Monthly Discharge of Catskill Creek, at South Cairo, N. Y.

[Drainage area, 263 square miles.]

YEAR.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1901.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	....	....	....	....	....
June	....	....	....	....	....
July	473	37	114	.43	.50
August	167	24	57	.22	.25
September	117	42	60	.23	.26
October	96	37	53	.20	.23
November	75	42	48	.18	.20
December	26,600	42	1,245	4.73	5.45
1902.					
January	9,459	63	615	2.34	2.70
February	3,787	63	451	1.71	1.78
March	18,600	304	2,596	9.87	11.38
April	18,300	219	1,396	5.31	5.93
May	352	53	144	.55	.63
June	268	37	61	.23	.26
July	3,026	42	639	2.43	2.80
August	1,191	46	202	.77	.89
September	2,822	46	283	1.08	1.20
October	1,691	152	520	1.98	2.28
November	449	96	199	.76	.85
December	5,059	182	784	2.98	3.44
1903.					
January	1,615	85	356	1.35	1.56
February	3,758	112	508	1.93	2.01
March	6,692	401	1,407	5.35	6.17
April	1,663	112	567	2.16	2.41
May	99	18	45	.17	.20
June	3,094	18	686	2.61	2.91
July	376	26	74	.28	.32
August	3,406	35	332	1.26	1.45
September	1,360	37	183	.70	.78
October	....	28	*a* 748	2.84	3.27
November	766	120	232	.88	.98
December	1,760	88	390	1.48	1.71

HOUSATONIC RIVER AT GAYLORDSVILLE, LITCHFIELD COUNTY, CONN.

One observation each day of the stream stage was made from a weight and chain gauge attached to the covered highway bridge at Gaylordsville, October 23, 1900, to July 20, 1902. Beginning July 20, 1902, two observations have been taken each day by G. H. H. Monroe, the observer.

The discharge is determined by current meter from a cableway of 200 feet span, located one and one-fourth miles below the bridge.

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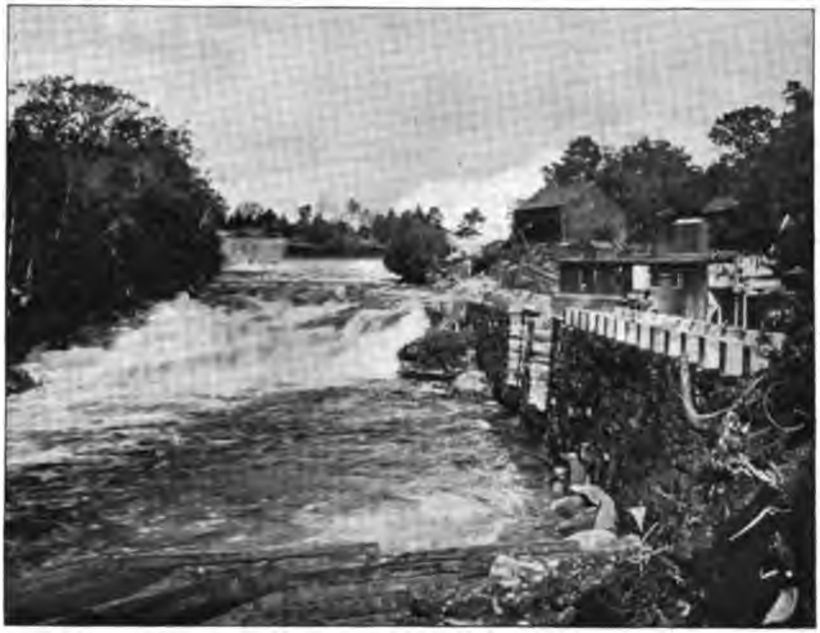
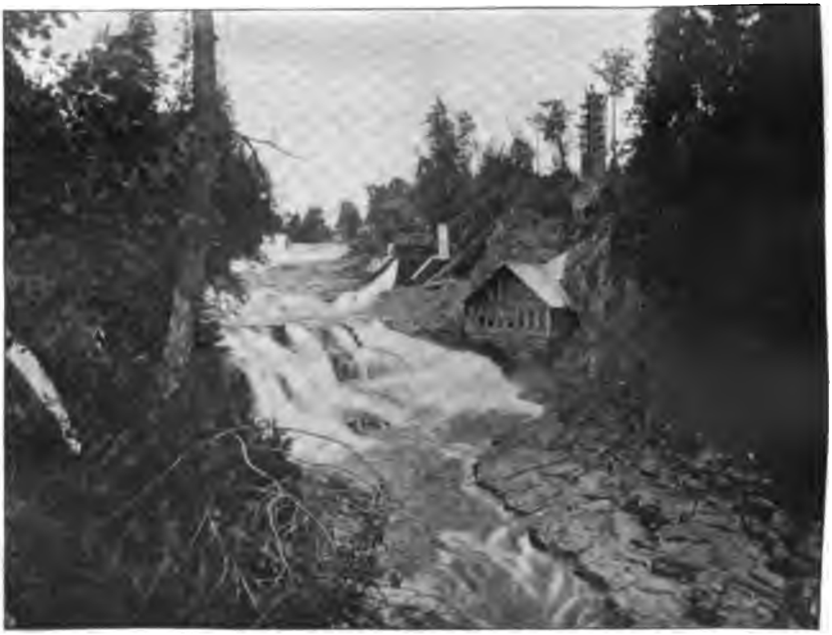
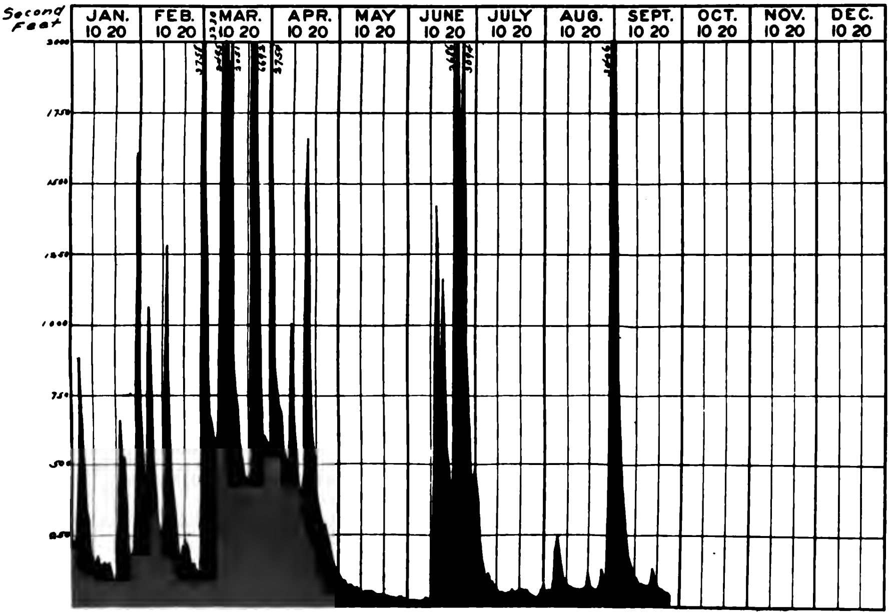
a Omitting freshet October 9, 1903.



East Canada Creek: Upper Fall, with 18 feet concrete dam and 1,100 feet flume to stand-pipe and power-house shown below.



East Canada Creek: Beardslee Falls and Power House, East Creek, Herkimer County, N. Y. Typical Power Development. See p. 153, 1902 Report.



Discharge of Catskill Creek at South Cairo, Greene County, N. Y., 1903.

East Oronoc Creek, Islip, Suffolk County, Long Island, N. Y.

Housatonic River has its source in Berkshire County, Mass. It flows southerly across Massachusetts and the western end of Connecticut, entering Long Island Sound. Its course is nearly parallel to the eastern boundary of New York State and it receives the drainage from Ten Mile River in New York.[a]

Current-meter Discharge Measurements of Housatonic River, at Gaylordsville, Conn.

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-foot.
	1900.			
August	9	E. G. Paul	3.3	450
August	10	E. G. Paul	3.25	422
October	20	E. G. Paul	3.10	370
October	24	E. G. Paul	3.00	303
	1901.			
August	8	A. E. Place	3.50	549
September	13	A. E. Place	4.00	912
September	28	W. W. Schlecht	3.77	701
October	29	W. W. Schlecht	4.05	951
November	13	W. W. Schlecht	4.82	1,864
November	23	W. W. Schlecht	4.11	965
December	28	W. W. Schlecht	5.16	2,520
	1902.			
January	11	W. W. Schlecht	5.0	2,184
February	14	W. W. Schlecht	8.3	[b]1,111
March	4	W. W. Schlecht	9.9	13,601
March	18	W. W. Schlecht	7.63	8,259
May	3	W. W. Schlecht	6.10	4,459
June	23	W. W. Schlecht	4.46	1,177
July	11	H. K. Barrows	4.3	1,159
July	22	H. K. Barrows	6.68	5,119
August	5	H. K. Barrows	4.28	983
August	20	H. K. Barrows	3.95	835
September	3	H. K. Barrows	3.45	543
September	19	H. K. Barrows	3.75	640
October	3	P. M. Churchill	5.35	2,133
November	15	F. H. Tillinghast	4.50	1,356
November	29	F. H. Tillinghast	4.40	1,282
December	20	F. H. Tillinghast	6.65	5,465
	1903.			
January	23	F. H. Tillinghast	5.5	2,621
March	31	F. H. Tillinghast	6.52	4,773
June	6	F. H. Tillinghast	3.60	532
July	24	F. H. Tillinghast	5.20	2,062
September	15	F. H. Tillinghast	3.90	785

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[a] The Water Power of Housatonic River is described in Report on Stream Gaugings contained in Supplement, Report of State Engineer and Surveyor of New York for 1902, pp. 304-308. The preliminary estimate of discharge for observations of 1900 and 1901 there given, has been replaced by the later figures, resulting from the completion of the discharge curve.

[b] Backwater from ice below.

Mean Daily Discharge, Second-Feet, of Housatonic River, at Gaylordsville, Conn.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1900.												
1	......	......	......	......	......	......	......	......	......	......	402	1,914
2	......	......	......	......	......	......	......	......	......	......	352	1,506
3	......	......	......	......	......	......	......	......	......	......	352	1,178
4	......	......	......	......	......	......	......	......	......	......	266	1,082
5	......	......	......	......	......	......	......	......	......	......	303	3,076
6	......	......	......	......	......	......	......	......	......	......	266	3,468
7	......	......	......	......	......	......	......	......	......	......	230	2,714
8	......	......	......	......	......	......	......	......	......	......	402	2,216
9	......	......	......	......	......	......	......	......	......	......	550	1,914
10	......	......	......	......	......	......	......	......	......	......	986	1,370
11	......	......	......	......	......	......	......	......	......	......	822	1,082
12	......	......	......	......	......	......	......	......	......	......	686	1,082
13	......	......	......	......	......	......	......	......	......	......	618	1,082
14	......	......	......	......	......	......	......	......	......	......	686	1,082
15	......	......	......	......	......	......	......	......	......	......	686	*a*
16	......	......	......	......	......	......	......	......	......	......	686	1,082
17	......	......	......	......	......	......	......	......	......	......	618	1,082
18	......	......	......	......	......	......	......	......	......	......	550	1,179
19	......	......	......	......	......	......	......	......	......	......	618	1,274
20	......	......	......	......	......	......	......	......	......	......	686	1,370
21	......	......	......	......	......	......	......	......	......	......	986	1,506
22	......	......	......	......	......	......	......	......	......	......	890	1,642
23	......	......	......	......	......	......	......	......	......	266	822	1,778
24	......	......	......	......	......	......	......	......	......	352	822	2,216
25	......	......	......	......	......	......	......	......	......	402	754	1,178
26	......	......	......	......	......	......	......	......	......	352	1,506	1,082
27	......	......	......	......	......	......	......	......	......	352	2,880	986
28	......	......	......	......	......	......	......	......	......	352	2,714	1,082
29	......	......	......	......	......	......	......	......	......	352	2,216	890
30	......	......	......	......	......	......	......	......	......	352	1,914	822
31	......	......	......	......	......	......	......	......	......	303	......	1,082
Mean	......	......	......	......	......	......	......	......	......	343	876	1,560
1901.												
1	1,274	402	451	2,548	4,300	4,300	618	550	1,178	1,178	890	890
2	890	451	550	2,548	4,300	3,860	550	686	1,274	1,082	1,082	986
3	*a* 186	451	618	2,548	4,740	3,272	754	550	1,642	1,370	890	1,082
4	*a*1,082	451	618	4,080	4,520	2,880	822	501	1,506	1,506	754	986
5	*a*1,178	352	986	5,204	3,860	2,880	686	451	1,506	1,274	686	890
6	1,370	303	822	4,960	3,076	2,382	890	451	1,274	1,082	986	890
7	1,370	501	822	6,960	2,880	2,382	890	822	1,274	890	754	822
8	1,274	550	618	9,610	2,548	2,880	754	1,778	1,274	822	754	754
9	1,082	501	550	8,800	2,382	2,880	754	1,274	890	890	754	822
10	1,274	686	7,480	8,272	2,382	2,714	754	986	822	890	686	2,050
11	986	550	9,340	6,700	3,272	2,382	822	890	890	754	550	2,880
12	1,642	451	7,480	5,448	4,520	1,914	890	822	1,082	754	618	3,664
13	890	501	3,860	4,960	4,080	1,778	890	686	890	754	1,778	3,272
14	550	686	2,880	4,080	3,860	1,506	822	686	890	2,382	1,914	3,468
15	686	618	3,076	3,664	3,076	2,382	618	618	890	5,448	1,642	11,254
16	754	501	3,076	3,664	2,880	1,642	550	686	986	3,860	1,506	9,340
17	1,274	501	1,506	2,880	2,548	1,370	686	618	986	3,468	1,370	8,272
18	890	501	1,506	2,548	2,548	1,082	618	686	1,642	2,548	1,274	7,480
19	550	402	1,778	2,382	3,468	1,178	618	890	1,370	2,216	1,082	5,692
20	501	451	1,778	2,382	4,300	1,082	618	754	1,274	1,914	1,178	4,080
21	754	501	14,300	6,830	4,300	986	618	986	1,082	1,778	1,082	3,076
22	618	550	10,702	12,352	3,468	890	550	1,642	1,082	1,506	1,082	2,216
23	686	501	7,220	9,880	3,468	1,178	501	1,778	890	1,370	986	1,914
24	550	402	6,440	10,150	3,076	1,642	618	1,778	754	1,274	1,082	2,382
25	618	451	5,204	10,978	5,692	1,506	618	5,692	822	1,178	1,506	2,382
26	686	303	5,204	8,404	5,448	1,178	550	5,448	754	1,178	1,778	2,050
27	754	501	6,700	6,700	5,692	1,082	550	3,272	754	1,082	1,370	2,548
28	686	451	5,936	5,936	5,692	890	550	2,382	754	890	890	2,216
29	550	......	5,204	6,180	5,936	890	550	1,778	822	890	890	4,520
30	550	......	4,300	4,740	5,692	754	501	1,506	1,274	1,178	1,082	12,626
31	501	......	3,468	......	5,204	......	686	1,274	......	986	......	7,744
Mean	865	481	4,015	5,880	3,974	1,925	674	1,385	1,084	1,561	1,097	3,658

a Stream frozen over. Interpolated.

***Mean Daily Discharge, Second-Feet, of Housatonic River, at Gaylordsville, Conn.*—(Continued).**

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
1	6,440	Ice obstructions	31,000	5,692	5,692	1,642	1,778	1,778	754	2,880	2,880	986
2	4,960		17,000	5,204	4,520	1,274	1,506	1,574	584	2,880	2,548	1,034
3	3,664		14,020	5,692	4,080	1,274	1,274	1,574	550	2,465	2,050	1,274
4	2,548		15,000	3,468	3,664	1,506	1,642	1,322	618	2,299	1,982	1,506
5	2,382		8,272	3,468	3,076	1,914	1,370	1,178	652	2,050	1,846	1,506
6	2,548		5,692	2,880	2,880	1,778	1,370	1,274	584	2,299	1,710	1,178
7	2,548		4,960	2,880	2,880	1,506	1,778	1,506	652	2,050	1,574	1,226
8	2,382		5,692	3,272	2,548	1,506	2,050	1,438	550	1,846	1,506	1,178
9	2,548		5,692	4,080	2,382	1,274	1,642	1,438	584	1,642	1,438	525
10	2,216		7,480	5,692	1,914	1,506	1,370	1,322	890	1,438	1,226	584
11	2,050		6,700	5,936	2,050	1,370	1,226	1,370	890	1,274	1,178	686
12	1,914		6,440	5,692	1,914	1,370	1,178	2,299	822	2,548	1,322	720
13	1,642		8,272	5,692	1,914	1,274	1,082	2,050	788	2,548	1,274	890
14	1,178		8,800	5,448	1,778	1,642	890	1,642	986	2,216	1,370	938
15	1,370		8,536	4,300	1,642	1,506	822	1,370	890	2,050	1,370	1,130
16	1,370		8,008	3,664	1,506	1,178	986	1,226	618	1,778	1,274	1,914
17	1,178		8,536	3,468	1,506	1,370	1,082	1,082	686	1,710	1,226	8,536
18	1,082		7,744	3,076	1,370	1,274	822	890	720	1,506	1,130	7,090
19	1,274		6,960	3,076	1,274	1,274	754	754	754	1,438	1,178	5,448
20	1,082		6,180	2,880	1,178	1,274	1,574	938	788	1,130	1,130	4,630
21	1,370		5,204	2,382	1,506	1,178	3,860	856	938	1,178	1,178	5,326
22	10,150		5,204	2,382	1,274	1,642	5,204	938	720	1,322	1,082	10,426
23	5,692		4,080	2,216	1,178	1,370	3,860	986	618	1,274	1,082	9,880
24	4,520		3,664	2,216	986	1,178	3,272	986	686	1,322	938	7,612
25	3,468		3,860	2,050	1,082	1,178	2,880	856	652	1,322	1,034	6,960
26	3,076		3,860	1,914	1,370	1,178	2,548	856	788	1,274	1,130	5,936
27	3,664		3,664	2,050	1,506	1,082	1,982	856	1,082	1,178	1,506	5,326
28	3,272		3,664	2,216	2,548	1,082	1,846	856	1,506	3,566	1,370	3,860
29	2,548	......	5,448	2,216	2,548	986	2,978	822	4,520	5,082	1,274	3,370
30	1,914	......	5,448	4,300	2,050	1,178	2,797	822	3,860	3,860	1,130	3,664
31	1,914	......	5,448	......	1,642	......	2,714	686	......	3,468	......	3,076
Mean	2,838	6,093	7,759	3,650	2,176	1,359	1,940	1,211	991	2,093	1,431	3,497
1903.												
1	2,714	3,566	11,116	4,740	1,506	618	5,814	1,778	3,664	890	1,710	1,080
2	2,631	3,468	8,140	3,970	1,574	550	4,740	1,322	2,978	890	1,440	1,130
3	3,566	3,664	6,960	4,080	1,370	652	3,664	1,178	2,548	986	1,370	1,270
4	3,860	4,520	5,448	3,970	1,226	652	2,978	1,226	2,216	890	1,510	1,230
5	3,860	7,350	5,082	4,080	1,322	652	2,465	2,133	1,710	720	1,640	1,130
6	3,370	5,326	4,080	3,970	1,370	618	2,548	2,978	1,710	720	1,510	1,130
7	2,978	5,448	3,970	3,664	1,438	618	2,797	4,850	1,034	822	1,440	1,180
8	2,880	3,860	4,630	4,740	1,274	1,082	2,299	3,468	1,226	890	1,370	1,080
9	2,465	3,370	7,612	6,700	1,130	1,226	2,133	2,880	1,274	9,745	1,230	1,230
10	2,050	2,880	7,612	6,570	1,082	1,034	1,914	2,631	1,034	10,288	1,270	1,510
11	1,914	2,880	7,612	5,326	890	938	1,710	2,548	1,370	7,744	1,230	1,320
12	2,050	5,326	7,612	5,692	986	2,714	1,642	1,982	1,274	5,570	1,230	986
13	1,846	5,448	7,090	4,520	986	5,570	1,710	1,710	1,178	4,520	1,030	2,380
14	1,846	4,630	6,440	3,970	890	5,448	1,574	1,506	986	3,370	1,130	2,710
15	1,778	4,080	5,814	3,970	986	6,058	1,778	1,370	822	3,272	1,130	2,220
16	2,050	3,272	5,692	3,664	938	6,570	1,574	1,370	986	2,978	1,080	1,850
17	1,914	2,631	4,410	3,370	890	5,814	1,438	1,178	986	2,631	2,460	1,780
18	*a*1,642	1,982	3,860	3,076	686	4,850	1,370	1,034	1,778	3,370	3,600	1,510
19	*a*1,082	16,100	3,762	2,880	686	3,970	1,370	1,034	2,216	2,978	3,860	1,320
20	*a*3,664	16,400	3,370	2,714	822	3,970	1,274	986	1,574	2,797	3,570	2,300
21	3,664	*b*25,700	3,076	2,216	754	7,612	1,778	1,370	1,274	2,465	2,550	8,800
22	3,468	14,450	5,326	2,133	822	9,880	1,778	1,370	1,130	2,216	2,130	5,810
23	2,797	14,600	7,480	2,216	754	8,668	2,880	1,322	938	2,133	1,980	5,330
24	2,133	5,082	10,564	2,050	652	8,008	2,465	938	1,034	2,631	2,130	3,860
25	1,982	2,548	9,205	1,982	584	6,570	2,050	822	1,034	2,299	1,980	3,570
26	1,914	1,982	8,404	1,642	584	5,448	3,174	1,322	938	2,050	1,980	2,980
27	1,914	2,133	7,480	1,642	720	4,630	1,226	1,642	788	2,133	1,520	1,710
28	2,050	7,090	5,692	1,642	754	3,860	1,178	1,574	1,034	1,846	1,440	1,510
29	3,076	......	5,326	1,710	986	3,566	1,178	2,631	938	1,982	1,230	1,780
30	4,190	......	4,190	1,642	856	5,692	1,710	4,080	938	1,778	1,180	1,780
31	4,080	......	5,082	......	754	......	2,133	3,970	......	1,642	......	2,130
Mean	2,627	6,421	6,198	3,485	977	3,918	2,205	1,942	1,420	2,879	1,753	2,244

a Approximate river somewhat ice obstructed January 19, 20, 21, 1903.
a Approximate river somewhat ice obstructed February 19-24, 1903.
b Approximate, exceeds discharge measurements.

Estimated Monthly Discharge of Housatonic River, at Gaylordsville, Conn.

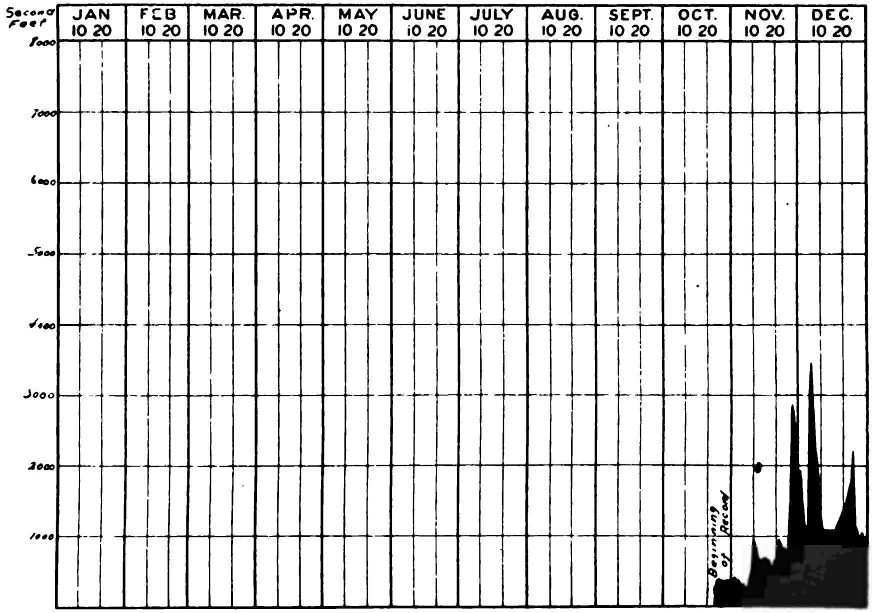
[Drainage area, 1,020 square miles.]

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1900.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	....	....	....	....	....
June	....	....	....	....	....
July	....	....	....	....	....
August	....	....	....	....	....
September	....	....	....	....	....
October	....	....	....	....	....
November	2,880	230	876	.858	.96
December	3,468	822	1,560	1.529	1.76
1901.					
January	1,642	501	865	.848	.98
February	686	303	481	.471	.49
March	14,300	451	4,015	3.935	4.54
April	12,352	2,382	5,880	5.762	6.43
May	5,936	2,382	3,974	3.895	4.50
June	4,300	754	1,925	1.887	2.11
July	890	501	674	.661	.76
August	5,692	451	1,385	1.357	1.57
September	1,642	754	1,084	1.062	1.18
October	5,448	754	1,561	1.530	1.76
November	1,914	550	1,097	1.075	1.20
December	12,626	754	3,653	3.580	4.13
1902.					
January	10,150	1,082	2,838	2.781	3.21
February	15,800	1,274	6,093	*a*	*a*
March	31,000	3,664	7,759	7.604	8.77
April	5,936	1,914	3,650	3.577	3.99
May	5,692	986	2,176	2.132	2.46
June	1,914	986	1,359	1.332	1.48
July	5,204	754	1,940	1.901	2.19
August	2,299	686	1,211	1.187	1.37
September	4,520	550	2.991	.971	1.08
October	5,082	1,130	2,093	2.051	2.36
November	2,880	938	1,431	1.402	1.56
December	10,426	525	3,497	3.427	3.94
1903.					
January	4,190	1,082	2,627	2.574	2.96
February	25,700	1,982	6,421	6.293	6.54
March	11,116	3,076	6,198	6.074	7.00
April	6,700	6,642	3,485	3.415	3.82
May	1,574	584	977	.957	1.11
June	9,880	550	3,918	3.840	4.28
July	5,814	1,178	2,205	2.161	2.49
August	4,850	822	1,942	1.903	2.19
September	3,664	788	1,420	1.392	1.55
October	10,288	720	2,879	2.821	3.25
November	3,860	1,030	1,753	1.718	1.92
December	8,800	1,030	2,245	2.200	2.54

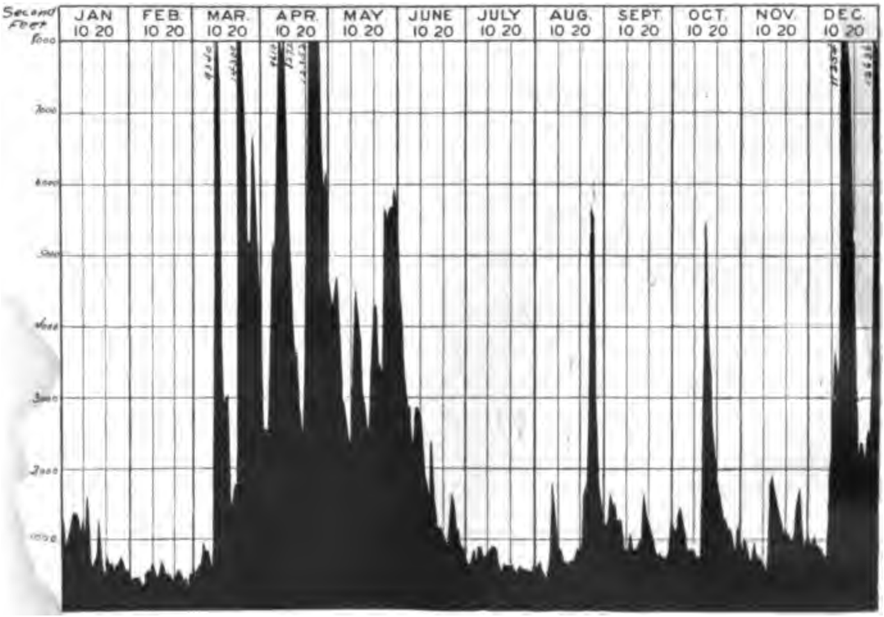
a Ice obstructions.

TEN MILE RIVER AT DOVER PLAINS, DUTCHESS COUNTY, N. Y.

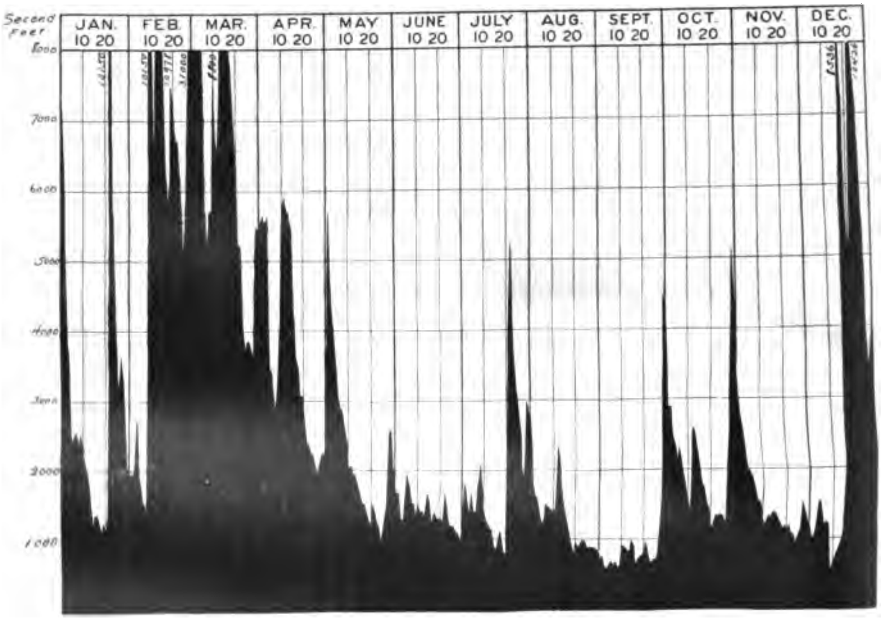
A current-meter station was established September 16, 1901, at Tabor's Bridge, which crosses Ten Mile River about two miles below Dover Plains Village. The location of the gauging station



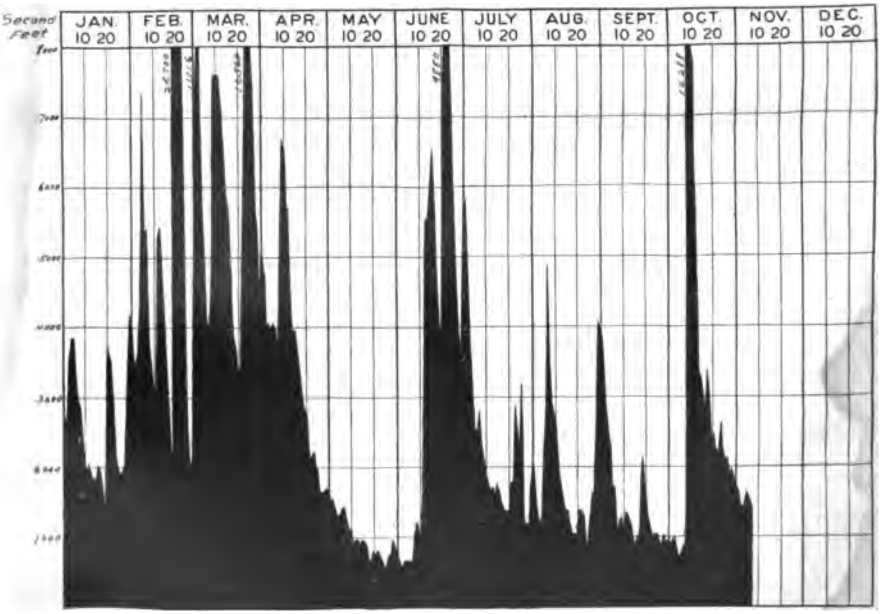
Discharge of Housatonic River at Gaylordsville, Conn., 1900.



Discharge of Housatonic River at Gaylordsville, Conn., 1901.



Discharge of Housatonic River at Gaylordsville, Conn., 1902.



Discharge of Housatonic River at Gaylordsville, Conn., 1903.

may be seen on the Clove sheet No. 230 of the U. S. Geological Survey Topographic atlas. The bridge stands squarely across the stream bed, which is of sand and gravel. The road adjoining the bridge is overflowed at times of extreme freshet. The stream stage was observed each morning and night by J. J. O'Brien from a weight and chain gauge attached to the bridge. The station was discontinued November 7, 1903.

Ten Mile River drains an area of diversified topography, including broad flats and marshes in the basin of Swamp River, and extensive areas under cultivation, and sparsely timbered hills in the region of Chestnut Range. The drainage lies chiefly in New York State, the stream crossing the line into Connecticut one-half mile below the point of inflow to Housatonic River.[a]

Current-meter Discharge Measurements of Ten Mile River, at Dover Plains, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1901.			
September 16	A. E. Place	....	245
September 28	W. W. Schlecht	4.36	70.3
October 15	W. W. Schlecht	7.19	693
October 26	W. W. Schlecht	5.01	188
November 6	W. W. Schlecht	4.88	140
November 11	W. W. Schlecht	4.75	122
November 22	W. W. Schlecht	4.76	123
November 22	W. W. Schlecht	4.76	121
December 2	W. W. Schlecht	4.75	125
December 17	W. W. Schlecht	8.41	1,213
1902.			
July 21	W. W. Schlecht	7.52	821
August 4	W. W. Schlecht	5.03	185
August 9	W. W. Schlecht	4.62	100
September 2	W. W. Schlecht	4.29	63
October 2	P. M. Churchill	6.14	443
November 14	F. H. Tillinghast	5.21	211
November 28	F. H. Tillinghast	5.14	211
December 19	F. H. Tillinghast	8.62	1,330
1903.			
January 10	F. H. Tillinghast	5.75	315
January 22	F. H. Tillinghast	7.36	833
February 4	F. H. Tillinghast	6.30	480
February 13	F. H. Tillinghast	5.00	179
February 27	F. H. Tillinghast	5.52	314
March 3	F. H. Tillinghast	10.75	2,386
March 30	F. H. Tillinghast	6.86	688
April 7	F. H. Tillinghast	6.52	568
April 15	F. H. Tillinghast	6.47	526
May 2	F. H. Tillinghast	6.80	640
May 15	F. H. Tillinghast	5.22	230
May 28	F. H. Tillinghast	5.84	380
June 5	F. H. Tillinghast	4.20	61
June 5	F. H. Tillinghast	4.21	57
June 10	F. H. Tillinghast	4.79	158
June 30	F. H. Tillinghast	5.26	249

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[a] Water Power of Ten Mile River is described in Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor of New York for 1902, pp. 300 to 303. Gauge heights and discharge measurements there given are subject to a slight correction to reduce them to a uniform datum.

Mean Daily Discharge, Second-Feet, of Ten Mile River, at Dover Plains, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	......	......	......	......	......	......	......	......	......	179	167	119
2	......	......	......	......	......	......	......	......	......	143	159	122
3	......	......	......	......	......	......	......	......	......	175	159	167
4	......	......	......	......	......	......	......	......	......	175	151	280
5	......	......	......	......	......	......	......	......	......	166	156	425
6	......	......	......	......	......	......	......	......	......	151	156	259
7	......	......	......	......	......	......	......	......	......	135	151	180
8	......	......	......	......	......	......	......	......	......	119	148	148
9	......	......	......	......	......	......	......	......	......	119	140	138
10	......	......	......	......	......	......	......	......	......	119	185	512
11	......	......	......	......	......	......	......	......	......	119	125	623
12	......	......	......	......	......	......	......	......	......	119	172	512
13	......	......	......	......	......	......	......	......	......	108	384	445
14	......	......	......	......	......	......	......	......	......	491	280	549
15	......	......	......	......	......	......	......	......	......	654	234	2,635
16	......	......	......	......	......	......	......	......	......	532	196	1,722
17	......	......	......	......	......	......	......	......	175	462	186	1,126
18	......	......	......	......	......	......	......	......	238	379	384	778
19	......	......	......	......	......	......	......	......	175	311	156	664
20	......	......	......	......	......	......	......	......	151	280	156	512
21	......	......	......	......	......	......	......	......	143	276	151	397
22	......	......	......	......	......	......	......	......	143	259	140	345
23	......	......	......	......	......	......	......	......	127	249	135	389
24	......	......	......	......	......	......	......	......	111	234	135	384
25	......	......	......	......	......	......	......	......	108	217	217	397
26	......	......	......	......	......	......	......	......	95	175	196	526
27	......	......	......	......	......	......	......	......	103	179	159	549
28	......	......	......	......	......	......	......	......	82	186	167	555
29	......	......	......	......	......	......	......	......	140	172	151	2,360
30	......	......	......	......	......	......	......	......	280	167	130	3,360
31	......	......	......	......	......	......	......	......	......	162	......	2,094
Mean	......	......	......	......	......	......	......	......	148	232	179	751
1902.												
1	954	259	a3,157	692	809	157	141	322	67	445	445	141
2	710	439	4,692	645	809	149	109	221	59	465	368	146
3	695	695	3,002	583	661	132	125	173	56	350	350	205
4	439	433	1,350	508	568	157	153	169	67	268	324	226
5	433	280	809	451	523	141	180	153	59	316	316	190
6	454	249	480	480	480	125	165	137	56	465	303	200
7	439	196	583	544	436	109	169	173	61	337	268	205
8	358	196	583	630	381	146	121	163	64	253	263	215
9	319	167	1,599	758	329	157	133	141	72	226	247	274
10	293	159	2,497	1,043	296	146	105	137	96	211	232	263
11	306	196	1,717	860	236	117	101	416	72	247	211	215
12	293	196	1,505	602	215	101	89	251	67	538	200	205
13	255	143	1,693	599	215	188	94	236	89	568	211	205
14	217	633	1,372	552	205	184	67	200	106	474	205	232
15	228	228	1,081	538	205	125	64	179	92	402	211	263
16	162	207	932	480	194	149	117	105	81	350	190	552
17	119	186	1,263	474	173	184	98	98	64	303	173	2,423
18	186	186	1,043	416	162	141	64	94	64	278	169	1,708
19	196	175	676	389	173	114	78	94	81	311	163	1,319
20	186	151	544	355	179	94	173	98	114	290	154	1,081
21	186	185	538	329	162	133	819	109	122	226	157	1,097
22	3,125	125	552	296	149	165	876	105	92	205	162	3,054
23	1,105	84	568	272	133	130	614	89	94	194	157	2,526
24	512	95	583	251	117	121	436	86	86	190	154	1,451
25	358	119	523	236	117	94	416	86	89	173	162	1,182
26	332	363	480	236	257	89	368	75	83	157	184	998
27	991	1,247	465	816	316	149	316	69	184	165	232	843
28	863	1,883	977	303	381	83	842	61	661	860	200	701
29	571	......	1,043	316	285	89	303	58	1,122	860	173	661
30	425	......	932	826	205	184	407	85	503	623	154	676
31	280	......	792	......	184	......	303	61	......	509	......	676
Mean	516	835	1,227	502	308	135	242	143	151	363	225	778

a Stream more or less frozen. Discharge approximate, and probably in excess.

***Mean Daily Discharge, Second-Feet, of Ten Mile River, at Dover Plains, N. Y.* —(Concluded).**

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	654	599	2,586	724	141	72	1,051	146	532	119	255	......
2	692	798	1,251	620	133	69	832	124	432	103	228	......
3	887	792	877	552	141	58	614	108	371	93	221	......
4	792	1,014	713	614	177	58	494	135	301	103	213	......
5	630	2,296	651	620	145	58	416	416	293	108	238	......
6	614	1,043	583	538	133	52	374	512	249	111	242	......
7	529	741	552	523	121	102	342	936	217	98	217	......
8	494	614	781	747	113	261	285	623	186	119	......	......
9	451	568	1,293	1,293	113	240	242	468	186	3,894	......	......
10	363	518	1,170	1,051	121	161	209	379	179	2,912	......	......
11	316	509	1,089	877	113	109	200	286	175	1,698	......	......
12	*b*400	1,263	995	713	91	309	173	280	156	1,166	......	......
13	368	895	826	630	80	457	278	238	151	924	......	......
14	342	730	713	583	67	355	184	207	143	751	......	......
15	337	577	651	645	80	717	188	167	130	642	......	......
16	303	518	583	523	80	1,014	165	156	143	580	......	......
17	298	436	544	471	85	667	137	213	358	602	......	......
18	256	355	532	413	69	614	146	167	432	727	......	......
19	298	422	465	387	58	532	179	159	319	580	......	......
20	247	408	407	329	69	544	153	213	238	532	......	......
21	724	342	428	303	78	1,934	251	213	179	468	......	......
22	896	329	903	290	74	2,078	194	167	159	433	......	......
23	451	303	1,803	272	72	1,451	544	143	140	433	......	......
24	350	284	1,955	261	74	1,372	263	143	130	512	......	......
25	342	251	1,460	251	51	1,043	192	217	127	416	......	......
26	335	257	1,170	219	45	806	167	276	135	371	......	......
27	278	274	977	194	38	685	135	200	119	337	......	......
28	431	2,132	860	169	63	568	124	200	175	319	......	......
29	561	......	724	153	110	792	111	812	143	285	......	......
30	1,062	......	636	145	91	1,575	270	737	127	276	......	......
31	775	......	815	......	89	......	255	642	......	270	......	......
Mean	499	688	935	504	94	627	296	312	221	645	231	......

b Discharge approximate January 12 to 20 inclusive.

Estimated Monthly Discharge of Ten Mile River, at Dover Plains, N. Y.
[Drainage area, 195 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1901.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	....	....	....	....	....
June	....	....	....	....	....
July	....	....	....	....	....
August	....	....	....	....	....
September	....	....	....	....	....
October	654	108	232	1.190	1.37
November	384	125	179	.918	1.03
December	3,360	119	751	3.852	4.44
1902.					
January	3,125	119	516	2.647	3.06
February	1,833	84	335	1.718	1.79
March	4,692	465	1,227	6.294	7.26
April	1,043	236	502	2.575	2.88
May	809	117	308	1.580	1.82
June	188	83	135	.692	.77
July	876	64	242	1.241	1.43
August	416	58	143	.733	.84
September	1,122	56	151	.774	.86
October	800	157	363	1.862	2.14
November	445	154	225	1.154	1.28
December	3,054	141	778	3.991	4.60
1903.					
January	1,062	247	499	2.559	2.95
February	2,296	251	688	3.529	3.67
March	2,586	407	935	4.796	5.53
April	1,293	145	504	2.585	2.89
May	177	38	94	.482	.55
June	2,078	52	627	3.216	3.59
July	1,051	111	296	1.518	1.74
August	936	108	312	1.600	1.84
September	532	119	221	1.133	1.26
October	3,894	93	645	3.308	3.82

LONG ISLAND AND LONG ISLAND SOUND DRAINAGE.[a]

BYRAM RIVER AND BRANCHES AT PEMBERWICK, SCHILT'S MILL, RIVERVILLE AND ROUND HILL, FAIRFIELD COUNTY, CONN.

The source of Byram River is in Byram Lake, Westchester County, N. Y. The stream is joined just above the New York-Connecticut State Line by Wampus River, a small tributary from the west. It is joined by the middle branch of Byram River at Riverville; this stream in turn comprising two branches known as the

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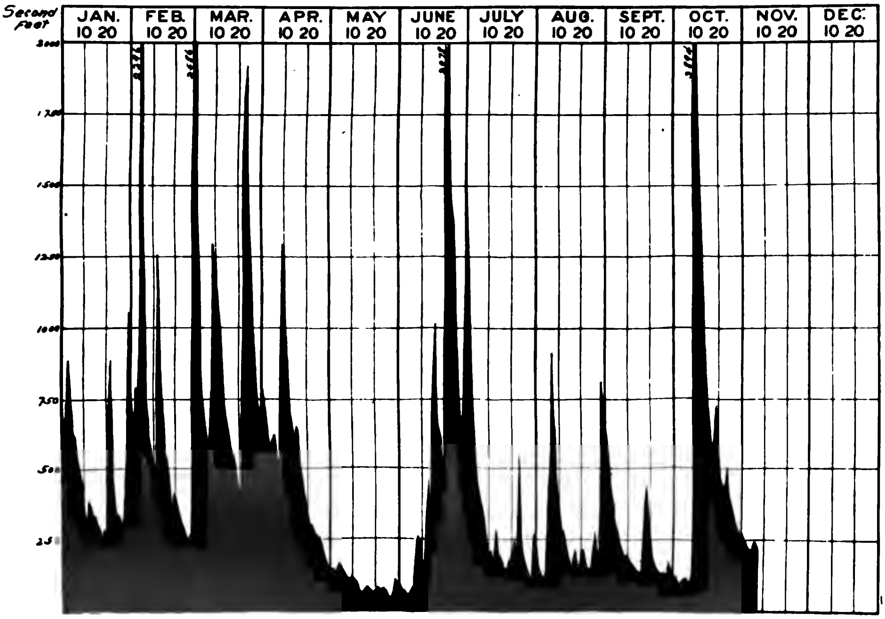
[a] The results of gaugings at the following named station has been omitted from this report:
Streams on South Shore, Long Island.



Discharge of Ten Mile River at Dover Plains, Dutchess County, N. Y., 1903.

East and Middle Branches of Byram River, which unite one mile above the juncture with the main stream. The drainage basin is shown on the Stamford quadrangle No. 232 of the U. S. Geological Survey Topographic map.

The stream flows from New York into Connecticut near Armonk, traverses the western end of Fairfield County, Conn., and enters New York again at Port Chester. The tributary area is rolling, the ridges lying mostly in a northerly and southerly direction, and the difference of elevation being commonly from 100 to 200 feet. There are a number of marsh areas often about one-fourth square mile in extent. Branching tributaries prevail and the area is quite uniformly though not minutely drained. It is mostly cleared land and is largely grass covered, being pasture or meadow with some tillage.

The drainage basin is underlaid by igneous rock, diorite near the mouth with numerous outcrops, and granite and gneiss in the upper reaches. It is characterized by its stony, boulder-covered surface. In January of 1903 the engineers of the Greenwich Water Company established gauging stations as follows:

Gauging Stations, Byram River Drainage Areas.

STREAM.	Location.	Date established.	Observer.
Byram River	Pemberwick, Conn......	January 8, 1903	Clifford Reynolds.
West branch Byram River.	Schilt's Mill, Conn	January 15, 1903	August Schilt.
East branch Byram River.	Near Round Hill, Conn.	January 1, 1903	R. G. Jones.
Middle branch Byram Riv.	Riverville, Conn	May 17, 1903	George Derby.

The surveys of the two dams used were made and a series of current-meter observations were taken in January, 1903. The gauge readings have been continued throughout the year 1903 by the Greenwich Water Company; additional measurements, to complete calibration curves for low-water, have been obtained by the U. S. Geological Survey.

The gauging station at Pemberwick is at the masonry dam of the Port Chester Bolt and Nut Company. It includes the discharge over the dam and the flow through two turbines. The latter quantity is obtained from the recorded daily run, gate opening and head. The discharging capacity of the turbines has been checked by current-meter measurements. The gauging station is below the junction of all the main branches. It is located one mile below Glenville and three miles above the inflow of the stream to Long Island Sound at Port Chester, N. Y. This station shows, therefore, nearly the entire yield of the drainage basin, excepting diversion by New York City above New York State Line.

The second gauging station is located on the West Branch of the stream at an unused timber dam at Schilt's Mill two miles along stream, above the mouth of the West Branch. During a portion of the year, the entire flow is diverted from this branch at a dam 1,100 feet north of the N. Y.-Conn. State Line. This dam affords a storage of 180,000,000 gallons of which 100,000,000 gallons are available. The gates and also the overflow discharge into an open channel 3,800 feet long, which leads into the Bronx River Drainage Basin, from which the water is conducted to the city of New York.[a]

The storage in Byram Lake, 160 acres in area, aggregating 550,000,000 gallons useful storage, is also available. The total area tributary to the New York city conduit is 7.66 square miles.

The Middle Branch of Byram River has been gauged by current-meter at a point just above its mouth and one-half mile below the junction of the East and Middle Branches. The measurements made afford data for an estimate of the low-water flow only. There is no extensive storage and no diversion from this portion of the drainage basin.

East Branch Byram River has been measured by current-meter at a point just above R. G. Jones Mill on the road from Round Hill to Greenwich. At this point the stream flows out from a swamp within the limits of which two branches are united. A small dam on one of these branches artificially controls the supply to the stream at times.

Numerous water powers have been developed on Byram River. The following table shows the drainage areas above the various dams and gauging stations:

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[a] The Water Supply of the City of New York, by E. Wedgmann, pp. 92-95.

Byram River Drainage Areas.

	Place to place.	Total square miles.
WEST BRANCH.		
Above foot Byram Lake, N. Y.	....	1.22
Above State Line, N. Y. city dam	6.44	7.66
Above gauging station dam	3.56	11.22
Above injunction with east branch	0.97	12.19
EAST BRANCH.		
Above gauging station (R. G. Jones farm)	....	4.85
Above R. G. Jones mill	.15	5.00
Above junction with middle branch	2.30	7.30
East and middle branches at junction	4.08	11.38
East and middle branches at Cat Rock	.22	11.60
East and middle branches, Smith sawmill	.05	11.65
East and middle branches, junction west branch	.44	12.09
BYRAM RIVER.		
Above junction of main branches as above	....	24.28
Above Reynolds Shoddy mill	2.36	26.64
Above Tingue mill, Glenville, Conn	.04	26.68
Above Port Chester Bolt and Nut Co., Pemberwick (gauging station)	.54	27.18
Above mouth (Port Chester, N. Y.)	4.48	31.66

Mean Daily Discharge, Second-Feet, of West Branch Byram River near Port Chester, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	28.30	96.58	34.94	12.42	*	6.37	1.00	22.63	16.96	12.42	1.00
2	......	22.63	41.58	28.30	12.42	*	1.00	1.00	19.80	16.96	12.42	1.00
3	......	22.63	34.94	28.30	7.87	*	.00	1.00	14.69	14.69	12.42	1.00
4	......	49.29	31.62	45.44	7.87	*	.00	1.00	10.14	12.42	12.42	1.00
5	......	45.44	28.30	45.44	10.14	*	1.00	16.96	12.42	12.42	14.69	1.00
6	......	28.30	28.30	31.62	7.87	*	1.00	16.96	22.63	12.42	16.96	1.00
7	......	22.63	28.30	31.62	7.87	*	1.00	4.87	10.14	12.42	12.42	1.00
8	......	38.26	53.15	57.00	4.87	*	1.00	1.87	7.87	12.42	12.42	1.00
9	......	41.58	82.70	82.70	*	*	1.00	1.00	4.87	282.5	7.87	1.00
10	......	28.30	57.00	49.29	*	*	1.00	1.00	1.87	195.70	7.87	1.00
11	......	41.58	53.15	38.26	*	*	1.00	1.00	7.87	101.45	7.87	1.00
12	......	82.70	53.15	31.62	*	22.63	1.00	1.00	1.87	78.20	7.87	1.00
13	......	38.26	41.58	28.30	*	1.87	1.00	1.00	1.87	69.52	7.87	16.96
14	......	31.62	38.26	38.26	*	1.00	1.00	1.00	1.87	57.00	7.87	6.37
15	31.62	28.30	34.94	121.55	*	12.42	1.00	1.00	1.87	49.29	7.87	1.87
16	22.63	31.62	28.30	82.70	*	4.87	1.00	1.00	61.18	38.26	10.14	1.87
17	24.46	22.63	28.30	49.29	*	.00	1.00	1.00	195.70	38.26	22.63	1.20
18	19.80	31.62	28.30	41.58	*	.00	1.00	1.00	101.45	61.18	24.46	1.00
19	12.42	31.62	28.30	34.94	*	3.37	1.00	1.00	69.52	38.26	14.69	.00
20	22.63	57.00	28.30	28.30	*	6.37	1.00	1.00	49.29	28.30	12.42	41.58
21	154.40	45.44	22.63	28.30	*	19.80	1.00	1.87	38.26	28.30	7.87	61.18
22	78.20	24.46	38.26	22.63	*	7.87	1.00	1.00	34.94	22.63	7.87	6.37
23	38.26	22.63	99.02	22.63	*	16.96	1.00	1.00	24.46	22.63	7.87	1.87
24	22.63	19.80	96.58	22.63	*	22.63	1.00	1.00	16.96	22.63	7.87	1.87
25	22.63	22.63	61.18	19.80	*	12.42	1.00	1.00	14.69	22.63	7.87	1.87
26	19.80	19.80	45.44	16.96	*	1.87	1.00	1.00	12.42	16.96	7.87	1.87
27	19.80	24.46	41.58	16.96	*	1.20	1.00	1.00	41.58	16.96	3.37	1.87
28	38.26	174.40	34.94	16.96	*	.00	1.00	1.00	61.18	16.96	1.87	7.87
29	53.15	......	34.94	16.96	*	57.00	1.00	38.26	28.30	16.96	1.87	10.14
30	57.00	......	28.30	14.69	*	34.94	1.00	49.29	22.63	16.96	1.20	7.87
31	34.94	......	49.29	......	*	......	1.00	28.30	......	14.69	......	16.96
Mean	39.57	38.53	45.07	37.60	8.92	11.96	1.11	5.85	30.50	44.09	10.03	6.54

* Discharge very small.

Mean Daily Discharge, Second-Feet, of Byram River, at Pemberwick, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May *a*	June *a*	July *a*	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	*73.4	*233.4	68.6	55.8	5.0	55.9	5.0	39.0	30.1	*39.9	17.6
2	......	43.6	86.2	57.3	10.4	*a*	56.4	*5.0	39.0	21.0	27.1	*a*
3	331.7	39.0	68.6	57.3	*39.9	*a*	28.1	9.5	27.1	27.6	39.9	*a*
4	*164.0	187.5	68.6	*92.2	18.6	*a*	26.0	......	27.1	*26.0	21.0	*a*
5	105.3	115.5	57.3	113.5	16.8	*a*	*26.0	223.6	20.8	21.0	30.1	14.1
6	90.8	69.2	57.3	57.3	15.6	*a*	18.0	55.7	*55.8	21.0	30.1	*14.1
7	65.4	38.6	52.3	73.2	17.2	**a*	13.0	98.8	39.9	21.0	21.7	20.0
8	65.4	*146.4	*170.1	86.2	14.0	39.9	13.0	20.1	18.0	21.0	*26.0	39.9
9	37.6	110.4	220.1	147.8	10.4	32.9	13.0	*26.0	18.0	1275.4	21.0	5.0
10	18.9	55.0	130.3	105.3	*5.0	39.9	13.0	20.6	18.0	324.9	21.0	55.8
11	*47.8	52.7	165.6	68.2	15.6	26.0	6.1	15.2	27.1	*207.8	21.0	26.0
12	100.4	207.8	121.9	*73.4	12.8	143.2	*	15.6	11.1	173.8	21.0	39.9
13	65.2	90.2	92.6	52.7	*a*	14.6	12.8	15.6	*26.0	150.8	21.0	*158.0
14	37.6	61.0	77.4	52.7	*a*	*73.4	12.8	15.6	18.0	108.3	27.6	55.8
15	27.1	*73.4	*73.4	364.1	*a*	65.2	....	7.4	13.0	71.6	*26.0	20.0
16	31.7	91.2	57.5	147.8	*a*	29.9	....	**a*	102.7	71.6	21.0	26.0
17	26.7	60.8	57.5	105.3	* *a*	15.2	....	15.6	274.4	63.3	30.1	9.5
18	*55.8	52.9	57.5	82.6	14.1	15.2	5.0	*a*	147.8	*92.5	55.9	14.1
19	22.6	39.0	50.5	*75.2	1.2	15.2	*32.9	*a*	98.6	71.8	55.9	39.9
20	20.0	31.7	43.6	52.7	1.2	11.6	5.0	47.8	*92.5	55.9	30.1	*247.7
21	532.8	88.6	38.6	52.9	1.2	*135.0	5.0	39.9	60.6	55.9	14.8	176.8
22	136.8	*92.5	*112.9	39.0	14.1	52.7	5.0	39.9	45.7	48.9	*32.9	45.7
23	68.6	50.5	375.5	39.0	9.5	105.3	39.9	*14.1	29.9	42.0	21.0	45.7
24	23.3	50.5	220.6	39.0	*	147.8	14.1	20.0	29.9	40.5	21.0	38.8
25	*39.9	43.6	125.7	29.3	14.1	52.7	5.0	9.5	24.5	*55.8	21.0	39.9
26	31.6	37.6	90.8	*39.9	2.4	32.8	*5.0	39.9	35.3	34.9	26.0	39.9
27	31.6	43.6	86.2	27.1	....	11.6	14.1	26.0	*39.9	33.0	21.0	*26.0
28	68.6	644.4	65.0	30.1	....	*26.0	9.5	27.2	122.9	30.1	7.6	27.1
29	86.2	......	*73.4	17.3	....	220.8	5.0	220.8	45.7	30.1	*	27.1
30	170.8	......	57.3	35.0	5.0	125.7	14.1	*73.4	38.8	30.1	17.6	27.1
31	82.6	......	105.3	......	5.0	....	9.5	62.5	......	19.4	......	27.1
Mean	89.2	94.3	106.2	76.1	13.6	59.9	17.2	43.3	52.9	105.7	26.6	47.3

Mean Daily Gauge Height, feet, of Middle Branch, Byram River, near Glenville, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	.78	1.78	.82	1.45	1.30	1.20	.92
2	......	......	......	......	......	.72	1.52	.80	1.32	1.20	1.20	.90
3	......	......	......	......	......	.72	1.42	.80	1.28	1.15	1.20	.95
4	......	......	......	......	......	.75	1.30	.80	1.20	1.00	1.20	1.05
5	......	......	......	......	......	.70	1.28	3.30	1.22	1.20	1.38	1.08
6	......	......	......	......	......	.70	1.22	1.85	1.45	1.15	1.42	1.00
7	......	......	......	......	......	.75	1.20	2.30	1.25	1.15	1.28	1.02
8	......	......	......	......	......	1.60	1.05	1.80	1.15	1.20	1.20	1.05
9	......	......	......	......	......	1.30	1.00	1.28	1.10	4.70	1.20	1.08
10	......	......	......	......	......	1.00	1.00	1.20	1.10	3.70	1.20	1.65
11	......	......	......	......	......	.90	1.05	1.12	1.25	2.80	1.20	1.40
12	......	......	......	......	......	2.23	.90	1.08	1.10	2.52	1.20	1.30
13	......	......	......	......	......	1.55	.90	1.02	1.05	2.40	1.20	2.08
14	......	......	......	......	......	1.15	1.10	1.00	1.02	1.75	1.22	2.00
15	......	......	......	......	......	1.80	1.00	1.00	1.00	1.65	1.20	1.50
16	......	......	......	......	......	1.60	.95	.95	2.35	1.55	1.20	1.30
17	......	......	......	......	.88	1.20	1.00	.92	2.65	1.65	1.50	1.10
18	......	......	......	......	.80	1.38	1.45	.95	2.02	2.20	1.58	1.08
19	......	......	......	......	.80	1.45	1.15	.90	1.82	1.62	1.45	1.10
20	......	......	......	......	.85	1.45	1.05	1.45	1.80	1.50	1.32	2.92
21	......	......	......	......	.80	2.50	1.00	1.15	1.80	1.48	1.22	2.90
22	......	......	......	......	.85	1.75	1.05	1.00	1.52	1.45	1.20	2.32
23	......	......	......	......	.82	2.15	1.15	.90	1.38	1.40	1.25	1.68
24	......	......	......	......	.78	2.60	.95	.92	1.28	1.40	1.22	1.60
25	......	......	......	......	.88	2.00	.90	.98	1.12	1.35	1.20	1.60
26	......	......	......	......	.78	1.65	.80	1.40	1.10	1.30	1.20	1.60
27	......	......	......	......	.75	1.48	.80	1.15	1.20	1.22	1.18	1.70
28	......	......	......	......	.78	1.38	.80	1.50	2.35	1.20	1.05	1.60
29	......	......	......	......	.82	2.92	.82	3.10	1.60	1.20	.92	1.42
30	......	......	......	......	.75	2.40	.90	1.95	1.40	1.20	.95	1.40
31	......	......	......	......	.78	......	.85	1.65	......	1.20	......	1.85

*Sunday.

a Record approximate, owing to alternate draught and refilling of pond.

Current-meter Discharge Measurements of Middle Branch, Byram River, at Riverville, Conn.

DATE.		Hydrographer.	Guage height, feet.	Discharge, second-feet.
	1903.			
May	16	E. P. Roundey	0.90	*a* 4.5
July	29	E. P. Roundey	0.75	1.7
July	30	E. P. Roundey	0.85	3.4
September	16	E. P. Roundey	0.90	5.5

Current-meter Discharge Measurements of East Branch, Byram River, near Greenwich, Conn.

DATE.		Hydrographer.	Guage height, feet.	Discharge, second-feet.
	1903.			
January	3	L. H. Ireland	2.35	*b* 100.6
January	7	L. H. Ireland	1.50	21.6
January	9	L. H. Ireland	1.92	36.7
January	9	L. H. Ireland	1.90	36.9
April	29	E. P. Roundey	1.21	*c* 1.71
April	29	E. P. Roundey	1.21	*d* 3.7
May	14	E. P. Roundey	1.08	1.6
July	29	E. P. Roundey	.91	*d* 0.73
July	30	E. P. Roundey	1.0	*d* 1.15
September	15	E. P. Roundey	1.1	*d* 2.26
September	16	E. P. Roundey	1.06	*d* 1.96

Mean Daily Discharge, Second-Feet, of East Branch, Byram River, near Greenwich, Conn.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	103.0	21.5	5.2	.73	24.8	.73	15.7	6.7	15.7	......
2	......	......	39.4	18.6	3.6	.63	21.5	.73	10.5	6.7	15.7	......
3	......	......	28.0	21.5	3.6	.63	18.6	.73	8.6	6.7	15.7	......
4	......	......	21.5	39.4	6.7	.63	15.7	.94	6.7	5.9	15.7	......
5	......	......	21.5	21.5	5.2	.73	10.5	*e*	6.7	5.2	24.8	......
6	......	......	21.5	21.5	3.6	.73	10.5	70.3	10.5	5.2	24.8	......
7	......	......	21.5	21.5	3.6	6.70	5.2	59.0	5.2	5.9	21.5	......
8	......	......	78.0	43.0	3.6	21.5	3.2	18.6	3.6	6.7	18.6	......
9	......	......	95.0	46.8	2.8	8.6	1.9	8.6	3.6	*e*	15.7	......
10	......	......	54.8	31.9	1.9	3.6	1.9	5.2	3.6	*e*	13.1	......
11	......	......	74.0	21.5	1.9	1.9	1.9	3.6	8.6	*e*	13.1	......
12	......	......	39.4	21.5	1.9	103.0	1.90	3.6	3.6	*e*	10.5	......
13	......	......	28.0	21.5	1.9	21.5	13.1	1.9	2.32	107.0	10.5	......
14	......	......	21.5	39.4	1.7	13.1	6.7	1.53	1.9	21.5	10.5	......
15	......	......	21.5	*e*	1.53	35.7	2.8	1.53	1.9	21.5	10.5	......
16	......	......	21.5	46.8	1.15	18.6	1.9	1.15	62.8	21.5	15.7	......
17	......	......	21.5	31.9	1.15	8.6	1.15	1.15	*e*	31.9	35.7	......
18	......	......	21.5	21.5	1.15	15.7	2.75	1.15	*e*	54.8	28.0	......
19	......	......	18.6	21.5	.83	21.5	13.1	1.15	8.2	21.5	20.0	......
20	......	......	21.5	18.6	.83	21.5	6.7	21.5	8.2	21.5	15.7	......
21	......	......	15.7	15.7	.73	82.0	2.8	18.6	8.2	15.7	10.5	......
22	......	......	31.9	15.7	.94	31.9	5.2	3.6	13.1	15.7	6.7	......
23	......	......	*e*	10.5	.83	59.0	6.7	1.53	5.9	15.7	6.7	......
24	......	......	82.0	10.5	.73	107.0	2.8	1.15	5.2	15.7	6.7	......
25	......	......	39.4	10.5	.73	35.7	1.53	5.2	3.6	13.1	3.6	......
26	......	......	24.8	10.5	.73	21.5	1.15	8.6	3.6	13.1	3.6	......
27	......	......	21.5	8.6	.73	21.5	1.04	5.2	54.8	15.7	3.6	......
28	......	......	21.5	6.7	.73	14.4	.73	*e*	54.8	18.6	3.6	......
29	......	......	21.5	6.7	.73	107.0	.73	*e*	21.5	18.6	1.9	......
30	......	......	21.5	6.7	.73	66.5	1.15	35.7	8.6	18.6	1.9	......
31	......	......	31.9	......	.73	......	1.04	21.5	......	15.7	......	......
Mean	......	......	36.2	21.8	2.01	28.4	6.15	10.86	20.46	19.1	13.4	......

a Conditions not favorable. *b* Conditions unfavorable. *c* Unfavorable section for measurement. *d* Measured 100 feet below gauge. *e* Above rating tables.

Estimated Monthly Discharge of East Branch, Byram River, at Greenwich, Conn.

[Drainage area, 4.85 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		Rainfall, inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1903.						
January	....	....	....	....	....	3.68
February	....	....	....	....	....	4.90
March	103	15.7	36.2	7.46	8.60	4.93
April	46.8	6.7	21.8	4.49	5.01	3.59
May	5.2	.73	2.01	.41	.47	.36
June	107	.63	28.4	5.85	6.53	10.15
July	24.8	.73	6.15	1.27	1.46	2.79
August	70.3	.73	10.86	2.24	2.58	9.66
September	82	1.9	20.46	4.22	4.71	3.59
October	107	5.2	19.1	3.93	4.53	7.77
November	28	1.9	13.4	2.76	3.08	1.53
December	....	....	....	....	....	4.32
The year	....	....	....	....	....	57.27

MIANUS RIVER NEAR STAMFORD, CONN. AND AT BEDFORD, WESTCHESTER COUNTY, N. Y.

Gauging stations were established at highway bridges on Mianus River and a series of current-meter measurements were made by the Engineers of the Greenwich Water Co., in January, 1903.

The lower gauging station is located at Benjamin Sedgwick's, two and one-half miles above the entrance of the stream to tidewater of Long Island Sound at Mianus. Observations of the stream stage have been made each morning and night from a gauge scale divided to feet and inches, attached to the bridge in a vertical position.

Additional current meter measurements were made both at Sedgwick's and Bedford during 1903 to determine the low-water flow of the stream and to complete the calibration curves. The gauging station at Bedford is located three and three-fourths miles upstream from the point where the river enters Connecticut. Observations of the stream stage have been taken each morning and night by Geo. Buresch from a gauge scale graduated to feet and inches, attached vertically to the bridge from which current-meter measurements are made. The discharge measurements and estimated mean daily flow for both the stations on Mianus River are given in the accompanying tables.

The drainage basin of Mianus River is very narrow in the lower two miles of the stream, gradually widening towards the headwaters. The stream rises in New York, near the Connecticut Line, flows northerly to Bedford where it turns abruptly to the south, crosses the line into Connecticut and continues southeasterly until tide water is reached. The area above Bedford is hilly and irregular, the peaks rising 200 to 300 feet above the stream. A number of small tributaries converge near the head of a marshy flat at the foot of which the gauging station is located.

The stream below Bedford flows in a narrow, deep valley and receives few tributaries. There are no lakes in the area, the only surface storage being in four small marsh tracts; the region is cleared meadow and farm land underlaid by gneissic rock.

The drainage basin is shown on the Stamford quadrangle of the U. S. Geological Survey Topographic map from which the drainage areas given below have been determined.

The deep cut valley underlaid by rock, and the comparative infrequency of tributaries favor the percolation of rainfall into the ground, and the regulation of the flow by natural causes. Much of fall in the stream has been developed for purposes of power, beginning with a tide mill now abandoned at Mianus.

Drainage Area of Mianus River.

	Place to place.	Total square miles.
Above Bedford, N. Y. Gauging Station		10.68
Above Buresch's Mill, N. Y.	.48	11.16
Above undeveloped water power site near Stanwich	7.52	18.68
Above River Bank Mills, Conn	7.86	26.54
Above Sedgwick's, Conn. Gauging Station	2.30	28.84
Above Mianus Mfg. Co. Dam, Conn	.59	29.43
Above Jessup Bros. Dam, Conn	.19	29.62
Above Palmer Bros. Dam, Conn	.27	29.89
Above mouth at Mianus, Conn	.45	30.34

Current-meter Discharge Measurements of Mianus River, at Sedgwick's, near Stamford, Conn.

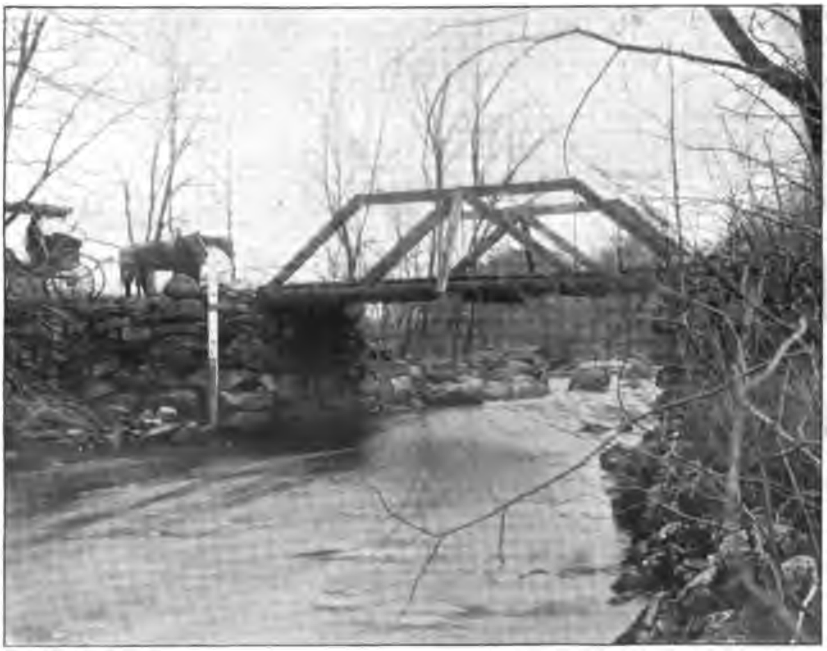
DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1903.			
January 7	L. H. Ireland	1.87	125.9
January 10	L. H. Ireland	1.80	87.6
January 10	L. H. Ireland	1.93	108.9
January 15	L. H. Ireland	2.58	*b* 100.4
January 15	L. H. Ireland	2.46	*b* 102.5
April 27	E. P. Roundey	1.25	44.0
April 27	E. P. Roundey	1.25	43.9
April 27	E. P. Roundey	1.25	*a* 37.6
May 14	E. P. Roundey	.58	13.0
May 14	E. P. Roundey	.58	14.1
May 14	E. P. Roundey	.58	*a* 13.5
July 29	E. P. Roundey	.42	7.0
July 30	E. P. Roundey	.50	*a* 8.5
September 15	E. P. Roundey	.66	*a* 16.5

a First bridge below Sedgwick's.
b Anchor ice obstructing channel.

Mean Daily Discharge, Second-Feet, of Mianus River, at Stamford, Conn.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	73.5	73.5	*a*	99.0	34.7	3.2	*a*	10.0	56.8	43.5	41.3	36.8
2	65.5	65.5	*a*	77.5	34.7	3.2	81.5	8.5	48.3	39.0	39.0	21.6
3	*a*	69.5	*a*	73.5	31.0	3.2	56.8	7.0	41.3	34.7	39.0	23.5
4	*a*	*a*	106.0	106.0	32.8	3.2	51.1	11.5	36.8	31.0	39.0	23.5
5	*a*	*a*	92.0	109.5	31.0	3.2	43.5	*a*	32.8	29.3	43.5	25.5
6	113.	106.0	86.7	77.5	29.3	3.2	41.3	113.0	34.7	27.5	45.9	43.5
7	92.	71.0	77.5	73.5	27.5	2.8	36.8	*a*	31.0	31.0	39.0	34.7
8	81.5	120.0	*a*	*a*	23.5	25.5	31.0	73.5	29.3	*a*	34.7	32.8
9	59.5	*a*	*a*	*a*	21.6	86.7	29.3	41.3	23.5	*a*	34.7	25.5
10	81.5	73.5	*a*	*a*	19.7	34.7	27.5	36.8	23.5	*a*	34.7	59.5
11	*a*	99.0	*a*	113.0	18.1	13.0	23.5	31.0	25.5	*a*	32.8	*a*
12	*a*	*a*	*a*	99.0	16.5	81.5	23.5	31.0	21.6	*a*	31.0	36.8
13	*a*	*a*	*a*	77.5	16.5	92.0	25.5	16.5	19.7	*a*	31.0	92.0
14	*a*	120.0	*a*	86.7	16.5	43.5	27.5	16.5	19.7	*a*	31.0	99.0
15	*a*	77.5	99.0	*a*	16.5	92.0	19.7	21.6	25.5	99.0	31.0	73.5
16	56.8	99.0	92.0	*a*	16.5	81.5	18.1	13.0	31.0	86.7	31.0	65.5
17	61.0	73.5	81.5	113.0	14.8	48.3	16.5	16.5	*a*	99.0	60.5	92.0
18	62.5	99.0	73.5	86.7	13.0	51.1	23.5	14.8	*a*	*a*	73.5	106.0
19	62.5	*a*	69.5	73.5	13.0	65.5	19.7	16.5	106.0	120.0	51.1	*a*
20	*a*	*a*	65.5	62.5	10.0	54.0	16.5	36.8	65.5	86.7	39.0	*a*
21	*a*	*a*	65.5	57.1	18.1	*a*	16.5	39.0	54.0	73.5	34.7	*a*
22	*a*	62.5	86.7	54.0	8.5	*a*	14.8	18.1	48.3	65.5	31.0	*a*
23	*a*	120.0	*a*	54.0	7.0	*a*	13.0	19.7	43.5	59.5	34.7	92.0
24	73.5	56.8	*a*	52.6	7.0	*a*	14.8	18.1	39.0	59.5	36.8	69.5
25	65.5	59.5	*a*	48.3	7.0	*a*	14.8	19.7	34.7	56.8	31.0	69.5
26	62.5	59.5	*a*	48.3	6.1	*a*	14.8	41.3	32.8	54.0	31.0	62.5
27	59.5	59.5	113.0	44.2	5.1	81.5	13.0	32.8	39.0	48.3	31.0	51.1
28	106.0	*a*	99.0	43.5	5.1	62.5	10.0	41.3	*a*	48.3	31.0	106.0
29	*a*	......	86.7	39.0	5.1	*a*	7.0	*a*	86.7	43.5	43.5	*a*
30	*a*	......	81.5	39.0	5.1	*a*	21.6	*a*	51.1	43.5	43.5	*a*
31	120.0	......	*a*	......	5.1	......	13.0	81.5	......	43.5	......	*a*
Mean	76.2	82.4	86.0	69.5	16.7	42.5	25.6	30.6	40.8	58.1	38.7	58.4

a Above rating table.



Mianus River: Lower Gauging Station at Sedgwick's, near Stamford, Conn.

Current-meter Discharge Measurements of Mianus River, at Bedford, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge second-feet.
	1903.			
January	5	L. H. Ireland	1.67	55.4
January	8	L. H. Ireland	1.33	39.8
January	8	L. H. Ireland	1.33	40.3
January	12	L. H. Ireland	1.74	73.6
January	12	L. H. Ireland	1.83	78.8
January	16	L. H. Ireland	1.06	29.6
January	16	L. H. Ireland	1.04	29.2
April	26	R. E. Horton	.93	17.95
April	27	E. P. Roundey	.90	17.9
April	27	E. P. Roundey	.90	18.2
May	14	E. P. Roundey	.67	7.6
May	14	E. P. Roundey	.67	7.1
July	29	E. P. Roundey	.42	3.6
July	30	E. P. Roundey	.58	8.6
September	15	E. P. Roundey	.54	8.5

Mean Daily Discharge, Second-Feet, of Mianus River, at Bedford, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	144.9	79.9	10.3	1.4	51.0	5.5	......	39.5	34.7	21.7
2	29.5	......	83.4	45.5	10.3	2.4	29.5	5.5	......	39.5	29.5	21.7
3	124.7	......	65.4	34.7	15.0	2.4	21.7	5.5	......	39.5	34.7	21.7
4	119.7	......	48.3	51.0	15.0	2.4	21.7	7.5	......	39.5	34.7	21.7
5	61.8	......	37.1	51.0	15.0	2.4	21.7	18.0	......	39.5	42.5	21.7
6	51.0	......	34.7	34.7	7.5	2.4	21.7	51.0	......	29.5	45.5	21.7
7	51.0	......	34.7	39.5	5.5	7.5	15.0	39.5	......	29.5	39.5	29.5
8	39.5	......	76.3	58.2	10.3	51.0	12.3	21.7	25.5	32.1	34.7	29.5
9	39.5	......	134.8	114.6	10.3	29.5	12.3	21.7	25.5	*b*	39.5	32.1
10	109.6	......	114.6	90.8	10.3	16.5	12.3	15.0	29.5	*b*	34.7	39.5
11	27.5	......	79.9	51.0	10.3	7.5	12.3	15.0	21.7	*b*	34.7	37.1
12	58.2	......	94.5	45.5	7.5	15.0	12.3	10.3	21.7	150.0	34.7	37.1
13	42.5	......	79.4	45.5	5.5	15.0	15.0	10.3	21.7	51.0	34.7	114.6
14	25.5	......	58.2	51.0	5.5	15.0	12.3	5.5	21.7	51.0	32.1	104.6
15	25.5	......	45.5	124.7	5.5	29.5	7.5	5.5	8.9	76.3	29.5	61.8
16	25.5	......	42.5	99.5	7.5	21.7	5.5	*a*	27.5	94.5	42.5	39.5
17	......	......	39.5	51.0	7.5	18.0	5.5	......	*b*	83.4	69.1	34.7
18	......	......	34.7	45.5	7.5	21.7	5.5	......	*b*	139.8	72.7	21.7
19	......	......	29.5	34.7	5.5	21.7	12.3	......	124.7	99.5	45.5	21.7
20	......	......	34.7	29.5	5.5	42.5	12.3	......	79.9	83.4	39.5	......
21	......	......	29.5	29.5	2.4	99.5	12.3	......	79.9	65.4	34.7	......
22	......	......	45.5	25.5	2.4	104.6	12.3	......	65.4	65.4	34.7	......
23	......	......	124.7	25.5	1.4	114.6	12.3	......	65.4	61.8	37.1	......
24	......	......	144.9	25.5	5.5	114.6	7.5	......	51.0	65.4	39.5	......
25	......	......	119.7	25.5	7.5	94.5	7.5	......	51.0	65.4	39.5	......
26	......	......	65.4	21.7	5.5	48.3	7.5	......	51.0	58.2	32.1	......
27	......	......	51.0	18.0	5.5	29.5	5.5	......	61.8	51.0	29.5	......
28	......	......	51.0	15.0	3.5	25.5	3.5	......	155.0	45.5	29.5	......
29	......	......	51.0	15.0	1.4	29.5	3.5	......	94.5	39.5	29.5	......
30	......	......	34.7	12.3	1.4	144.9	5.5	......	58.2	34.7	29.5	......
31	......	......	61.8	......	1.4	......	5.5	......	......	34.7	......	......
Mean	55.4	......	67.6	46.4	6.9	37.7	13.0	15.8	54.3	57.5	38.0	38.6

a No record from August 16 to September 7 inclusive. Repairing bridge gauge out.
b Freshet.

Estimated Monthly Discharge of Mianus River, at Bedford, N. Y.

[Drainage area, 10.68 square miles.]

MONTH.	Discharge in Second-feet.			Run-off.		Rainfall, inches.b
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1903.						
January 2-16	....	....	55.4	5.19	5.97	3.68
February	....	....	....	....	....	4.90
March	144.9	29.5	67.6	6.33	7.30	4.93
April	124.7	12.3	46.4	4.34	4.84	3.59
May	15	1.4	6.9	.65	.75	.36
June	144.9	1.4	37.7	3.53	3.94	10.15
July	51	3.5	13	1.22	1.41	2.79
August 1-15	51	5.5	15.8	1.48	1.71	9.66
September 8-30	....	8.9	a 54.3	5.08	5.69	3.59
October	....	29.5	a 57.5	5.38	6.19	7.77
November	72.7	29.5	38	3.56	3.97	1.53
December 1-19	114.6	21.7	38.6	3.61	4.15	4.32
The year	....	....	....	....	....	57.27

a Excluding freshet discharge.
b Means of U. S. Weather Bureau records at Bedford, Primrose and Norwalk.

PASSAIC RIVER DRAINAGE.

RAMAPO RIVER NEAR SUFFERN, ROCKLAND COUNTY, N. Y.

A gauging station has been established at the concrete arch highway bridge two miles below Suffern, N. Y., and 1½ miles below the N. J.-N. Y. State Line. The station is also 1 mile below the inflow of Mahwah River. A weight and chain gauge is attached to the bridge from which the stream stage has been observed once each day, beginning February 10, 1903. The gauging station is maintained in cooperation with the U. S. Weather Bureau. Current-meter measurements made before the station was established, together with those taken later, are given herewith.

The gauging station is located at the point where the stream emerges from the Highlands. The river then turns to the southwest and continues along the foot of Ramapo Ridge which lies on the right.

Ramapo River joins Pequannock and Wanaque Rivers to form Pompton River at Pompton Plains, N. J. The Ramapo River crosses the Highland Ridge in a deep, narrow valley, the slopes rising 500 feet or more on either side in a distance of one mile or less from the stream. The upper plateau contains a number of lakes. There are also several available reservoir sites at present undeveloped.

Gaugings of this stream were conducted by the State Geological Survey of New Jersey, February 7, 1890, to October 10, 1892. The record was maintained at the works of the Pompton Steel and Iron Company at Pompton, N. J., one and one-half miles along stream above the point of junction with Wanaque River. The discharge over the dam at this point was calculated by means of the Francis Weir Formula, and the resulting monthly mean flow is given in the accompanying table.[a]

The following comparative gaugings of Ramapo River, during the extremely dry period of 1894, are also given. Owing to pondage and intermediate mill dams, gaugings are not comparable day by day.

DATE.	AVERAGE DISCHARGE IN SECOND-FEET.	
	At Pompton, N. J.	At Ramapo, N. Y.
1894.		
September 13	15.53	16.29
September 14	15.53	15.13
September 15	15.53	15.58
September 16	24.86	13.94
September 17	38.84	15.08
September 18	38.84	18.41
September 19	38.84	....

The maximum discharge of Ramapo River at Pompton, N. J., is given as follows:[b]

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[a] Report of C. C. Vermeule on Water Supply, Vol. 3, Geological Survey of New Jersey, 1894, pp. 166-172. The author intimates that there may have been some leakage at the dam where the gaugings were made which is not taken account of.

[b] Report of C. C. Vermeule on Floods, contained in Report of State Geologist of New Jersey, 1902, pp. 25-57.

Maximum Discharge of Ramapo River.

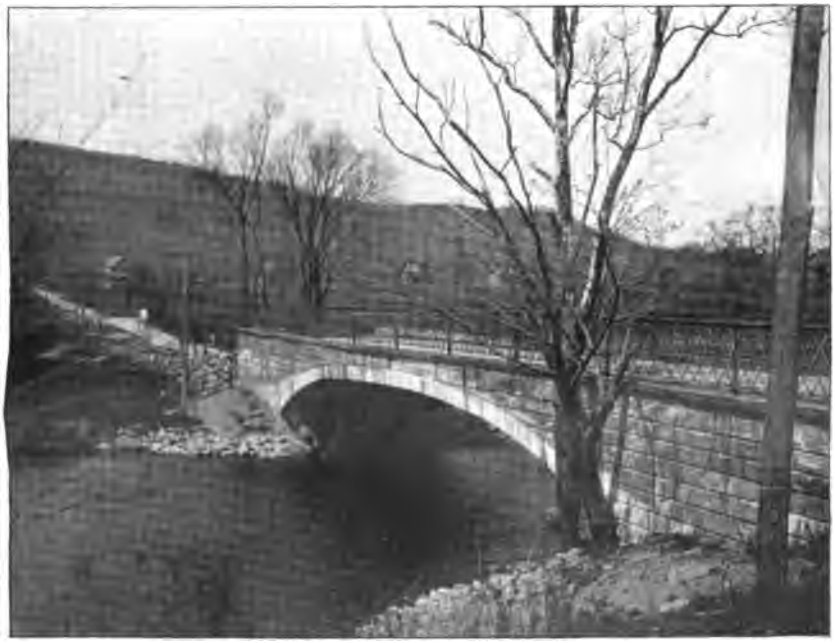
DATE.	Second-feet.	Second-feet per square mile.	Hours from beginning of rise to maximum.
September 22, 1882	10,540	66.09	24
February —, 1896	8,731	54.74	24
March 2, 1902	7,049	44.20	54

Drainage Areas of Ramapo River.

LOCATION.	Square miles.
Ramapo River above Ramapo, N. Y	86.4
Ramapo River above New York State Line	112.0
Ramapo River gauging station	118.8
Mahwah River above mouth	25.7
Ramapo River above Pompton Dam	159.5
Ramapo River above mouth	160.7

Daily Gauge Height, feet, of Ramapo River, near Suffern, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1903.												
1	......	......	6.6	4.6	3.5	2.7	5.7	2.9	4.4	3.0	4.0	3.6
2	......	......	5.6	4.4	3.4	2.7	4.8	2.8	4.0	3.0	3.9	3.6
3	......	......	4.9	4.4	3.4	2.7	4.3	2.7	3.7	3.0	3.9	3.6
4	......	......	4.7	4.4	3.4	2.7	4.0	2.7	3.5	2.9	3.9	3.7
5	......	......	4.5	4.5	3.0	2.7	3.8	4.2	3.4	2.9	3.9	3.7
6	......	......	4.3	4.2	3.4	2.6	3.7	4.1	3.3	2.9	3.9	3.7
7	......	......	4.2	4.1	3.8	2.6	3.6	4.7	3.2	2.9	3.9	3.7
8	......	......	4.5	4.3	3.3	2.7	3.4	4.0	3.1	2.9	3.8	3.7
9	......	......	5.2	5.3	3.2	2.9	3.3	3.5	3.0	9.8	3.8	3.7
10	......	4.3	5.1	4.8	3.2	2.8	3.2	3.4	3.0	8.6	3.7	3.9
11	......	4.1	4.9	4.5	3.1	2.8	3.1	3.2	3.0	7.1	3.7	3.8
12	......	5.1	4.8	4.4	3.1	3.1	3.1	3.3	2.9	6.6	3.7	3.8
13	......	4.9	4.6	4.3	3.1	4.5	3.2	3.1	2.9	6.2	3.6	3.8
14	......	4.6	4.3	4.1	3.0	3.7	3.2	3.0	2.9	5.7	3.6	4.7
15	......	4.4	4.2	6.4	3.0	4.9	3.1	2.9	2.9	5.3	3.6	4.2
16	......	4.3	4.1	6.9	3.0	5.4	3.0	2.9	2.9	5.1	3.6	3.9
17	......	4.3	4.0	6.1	2.9	4.6	3.0	2.8	5.4	4.9	4.0	3.9
18	......	4.0	3.9	5.4	2.9	4.2	2.9	2.8	5.0	5.1	5.2	3.9
19	......	3.9	3.9	5.0	2.9	4.0	3.6	3.2	4.2	4.9	4.6	......
20	......	3.9	3.8	4.7	2.8	4.2	3.3	3.2	4.0	4.7	4.3	4.0
21	......	3.9	3.8	4.5	2.8	4.6	3.2	3.1	3.8	4.6	4.1	6.5
22	......	3.7	4.8	4.3	2.8	6.0	3.1	3.0	3.6	4.5	4.0	5.8
23	......	3.7	5.1	4.2	2.8	5.2	3.4	2.9	3.5	4.4	4.0	5.0
24	......	3.7	6.4	4.1	2.7	5.6	3.2	2.9	3.4	4.6	4.0	4.7
25	......	3.7	6.0	3.9	2.7	5.5	3.0	2.8	3.2	4.5	3.9	4.7
26	......	3.7	5.3	3.9	2.7	5.0	3.0	2.9	3.1	4.4	3.8	4.6
27	......	3.7	4.8	3.8	2.7	4.4	2.9	2.9	3.1	4.3	3.8	4.3
28	......	4.7	4.6	3.7	2.7	4.1	2.8	2.9	3.2	4.3	3.9	4.1
29	......	......	4.4	3.7	2.7	3.9	2.7	4.3	3.2	4.2	3.6	4.0
30	......	......	4.2	3.6	2.7	6.7	3.1	4.8	3.1	4.0	3.6	4.0
31	......	......	4.0	......	2.7	......	3.0	4.7	......	4.0	......	4.1



Ramapo River: Gauging Station near Suffern, Rockland County, N. Y.

Current-meter Discharge Measurements of Ramapo River, near Suffern, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge, second-feet.
	1902.			
June	6	G. B. Hollister	....	*a*122
October	29	G. B. Hollister	....	678
	1903.			
June	18	E. P. Roundey	3.98	360
July	9	E. P. Roundey	3.18	134
July	9	E. P. Roundey	3.18	127
September	4	E. P. Roundey	3.39	186
October	19	William Nunn	4.72	491

a Wading 100 yards below bridge.

Estimated Monthly Discharge of Ramapo River, at Pompton, N. J.

[Drainage area, 159.5 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		Rainfall, inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1890.						
January	....	....	....	....	....	....
February 7-28	1,913	277	643	4.03	4.19	4.45
March	2,020	277	643	4.03	4.65	6.40
April	1,032	231	429	2.69	3.00	2.68
May	762	170	377	2.36	2.72	4.72
June	334	55	176	1.10	1.23	4.98
July	338	40	125	.78	.90	6.06
August	601	41	108	.68	.78	4.75
September	948	55	209	1.31	1.46	4.14
October	839	91	301	1.89	2.18	6.95
November	320	80	155	.97	1.08	.77
December	1,583	80	238	1.49	1.72	4.02
1891.						
January	4,552	318	879	5.51	6.35	8.51
February	2,130	264	853	5.35	5.56	4.50
March	1,686	299	729	4.57	5.27	4.25
April	695	143	335	2.10	2.34	2.80
May	187	41	94	.59	.68	2.70
June	79	33	52	.33	.37	2.13
July	70	22	44	.28	.32	4.88
August	536	33	135	.85	.98	5.54
September	318	40	94	.59	.66	2.28
October	53	40	42	.26	.30	2.39
November	601	33	207	1.30	1.45	2.93
December	1.175	104	391	2.45	2.82	4.77
1892.						
January	1,949	267	794	4.98	5.74	5.65
February	267	123	167	1.05	1.09	1.34
March	662	147	323	2.03	2.34	3.65
April	293	117	188	1.18	1.32	1.73
May	748	91	258	1.62	1.87	4.66
June	1,095	45	281	1.76	1.96	4.07
July	....	....	....	....	....	3.87
August	....	....	....	....	....	4.36
September	....	....	....	....	....	1.97
October	....	....	....	....	....	.68

DELAWARE RIVER DRAINAGE.

NEVERSINK RIVER AT PORT JERVIS AND GODDEFROY, ORANGE COUNTY, N. Y.

A temporary gauging station was established at East Main Street highway bridge in Port Jervis October 16, 1902.

Readings of the stream stage were taken each morning and night by Edwin J. Earley from that date until August 3, 1903. The results of current-meter measurements that were made, together with the daily discharge estimated from the observations, making allowance for backwater where necessary, are given herewith. Observations of the stream stage were also made August 5 to October 9, 1903, inclusive, at Goddefroy Station, by Fannie Olden. The means of the two readings taken each day are given in the accompanying table.

Neversink River rises in southwestern Ulster County. It drains an elongated narrow basin twenty miles in length, extending across Eastern Sullivan County. The stream is tributary to Delaware River at Port Jervis. The drainage basin contains a number of small lakes and also undeveloped storage reservoir sites.

Drainage Areas of Neversink River.[a]

	Square miles.
Above Quarryville	200.
Above Goddefroy	314.4
Above Port Jervis	345.0
Above mouth	346.

[a] From Bien's Atlas of New York.

Current-meter Discharge Measurements of Neversink River, at Port Jervis, N. Y.

DATE.		Hydrographer.	Gauge height, feet.	Discharge second-feet.
	1902.			
October	16	P. M. Churchill	7.45	945
November	10	J. H. Tillinghast	7.00	524
	1903.			
January	17	J. H. Tillinghast	6.78	517
February	12	J. H. Tillinghast	8.60	2,232
March	6	J. H. Tillinghast	8.10	1,625
March	25	J. H. Tillinghast	11.75	3,760
May	13	J. H. Tillinghast	6.20	250
August	17	J. H. Tillinghast	[a] 2.81	406
September	1	J. H. Tillinghast	[a] 4.14	1,424

NEVERSINK RIVER AT PORT JERVIS, N. Y.

Mean Daily Gauge Height, Feet, of Neversink River, at Goddefroy, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1									4.18	2.35		
2									3.85	2.35		
3									3.65	2.30		
4								3.70	3.28	2.25		
5								4.75	3.30	2.28		
6								4.50	3.05	2.20		
7								4.80	2.95	2.30		
8								4.15	2.90	2.62		
9								3.80	2.80	9.28		
10								3.70	2.80			
11								3.40	2.90			
12								3.85	2.72			
13								3.20	2.58			
14								2.95	2.50			
15								2.80	2.45			
16								2.70	2.48			
17								2.80	2.85			
18								2.72	3.85			
19								2.65	3.10			
20								3.20	2.70			
21								3.20	2.60			
22								2.90	2.58			
23								2.75	2.45			
24								2.70	2.40			
25								2.72	2.40			
26								3.32	2.40			
27								2.92	2.42			
28								2.98	2.40			
29								6.06	2.40			
30								4.90	2.40			
31								4.52				

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[a] Measurements and gauge readings taken at Suspension Bridge near Goddefroy, N. Y.

Mean Daily Discharge, Second-feet of Neversink River, at Port Jervis, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
1	......	......	......	......	......	......	......	......	......	......	1,090	459
2	......	......	......	......	......	......	......	......	......	......	906	459
3	......	......	......	......	......	......	......	......	......	......	788	669
4	......	......	......	......	......	......	......	......	......	......	748	748
5	......	......	......	......	......	......	......	......	......	......	748	590
6	......	......	......	......	......	......	......	......	......	......	708	590
7	......	......	......	......	......	......	......	......	......	......	708	590
8	......	......	......	......	......	......	......	......	......	......	669	459
9	......	......	......	......	......	......	......	......	......	......	590	397
10	......	......	......	......	......	......	......	......	......	......	590	397
11	......	......	......	......	......	......	......	......	......	......	590	459
12	......	......	......	......	......	......	......	......	......	......	590	459
13	......	......	......	......	......	......	......	......	......	......	590	459
14	......	......	......	......	......	......	......	......	......	......	459	459
15	......	......	......	......	......	......	......	......	......	......	459	444
16	......	......	......	......	......	......	......	......	......	985	459	524
17	......	......	......	......	......	......	......	......	......	906	459	*a*
18	......	......	......	......	......	......	......	......	......	827	459	2,920
19	......	......	......	......	......	......	......	......	......	827	428	3,470
20	......	......	......	......	......	......	......	......	......	748	*b*	2,840
21	......	......	......	......	......	......	......	......	......	669	*b*	2,050
22	......	......	......	......	......	......	......	......	......	653	*b*	*a*
23	......	......	......	......	......	......	......	......	......	630	428	*a*
24	......	......	......	......	......	......	......	......	......	606	428	*a*
25	......	......	......	......	......	......	......	......	......	590	428	2,170
26	......	......	......	......	......	......	......	......	......	524	428	1,690
27	......	......	......	......	......	......	......	......	......	459	459	1,350
28	......	......	......	......	......	......	......	......	......	2,440	590	1,090
29	......	......	......	......	......	......	......	......	......	*a*	590	985
30	......	......	......	......	......	......	......	......	......	2,570	459	906
31	......	......	......	......	......	......	......	......	......	1,460	......	866
Mean	......	......	......	......	......	......	......	......	......	992	587	1,056
1903.												
1	590	*a*	*a*	1,630	335	225	1,750	444	......	......	......	......
2	590	1,570	*a*	1,140	318	225	1,250	382	......	......	......	......
3	1,350	2,110	3,050	945	313	225	866	313	......	......	......	......
4	1,630	2.110	2,310	945	335	225	827	*c* 412	......	......	......	......
5	1,250	3,860	2,180	1,040	335	225	590	......	......	......	......	......
6	985	2,570	1,690	866	313	225	590	......	......	......	......	......
7	827	1,410	1,690	866	313	225	459	......	......	......	......	......
8	748	1,090	1,750	1,930	302	236	403	......	......	......	......	......
9	669	985	*a*	3,260	291	273	383	......	......	......	......	......
10	669	788	*a*	2,180	291	269	360	......	......	......	......	......
11	669	827	*a*	1,690	291	280	335	......	......	......	......	......
12	669	2,570	*a*	1,300	280	*a*	335	......	......	......	......	......
13	653	3,050	*a*	1,090	269	*a*	335	......	......	......	......	......
14	444	2,310	3,050	1,040	269	3,260	313	......	......	......	......	......
15	397	2,240	2,560	2,050	269	3,780	291	......	......	......	......	......
16	397	1,200	2,050	1,990	269	2,910	291	......	......	......	......	......
17	422	1,300	1,570	1,460	247	2,180	291	......	......	......	......	......
18	397	1,410	1,350	1,140	247	2,050	269	......	......	......	......	......
19	382	985	1,200	985	247	1,630	748	......	......	......	......	......
20	335	866	1,200	827	247	2,310	459	......	......	......	......	......
21	630	669	1,300	708	247	4,400	1,040	......	......	......	......	......
22	1,090	630	2,840	630	247	3,710	1,040	......	......	......	......	......
23	788	459	*a*	590	247	2,440	2,180	......	......	......	......	......
24	459	459	*a*	524	247	3,780	1,040	......	......	......	......	......
25	366	412	*a*	444	247	3,050	630	......	......	......	......	......
26	1,630	397	3,400	428	247	2,370	412	......	......	......	......	......
27	1,870	428	2,110	412	247	1,870	350	......	......	......	......	......
28	1,630	3,480	1,510	397	247	1,460	324	......	......	......	......	......
29	1,510	......	1,140	366	247	2,370	291	......	......	......	......	......
30	*a*	......	1,460	341	225	2,570	1,090	......	......	......	......	......
31	*a*	......	2,050	......	225	......	708	......	......	......	......	......
Mean	829	1,488	1,971	1,107	272	1,742	621	......	......	......	......	......

a Above rating table.
b No record.
c End of record.

Estimated Monthly Discharge of Neversink River, at Port Jervis, N. Y.

[Drainage area, 346 square miles.]

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1902.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	....	....	....	....	....
June	....	....	....	....	....
July	....	....	....	....	....
August	....	....	....	....	....
September	....	....	....	....	....
October	2,570	459	992	2.866	3.30
November	1,090	428	587	1.696	1.90
December	3,470	397	1,056	3.051	3.52
1903.					
January	1,870	335	829	2.395	2.77
February	3,860	397	1,488	4.300	4.48
March	8,400	1,140	1,971	5.696	6.57
April	3,280	341	1,107	3.199	3.57
May	335	225	272	.786	.90
June	4,400	225	1,742	5.034	5.62
July	2,180	291	621	1,794	2.06
August	....	....	....	....	....
September	....	....	....	....	....
October	....	....	....	....	....
November	....	....	....	....	....
December	....	....	....	....	....

WEST BRANCH DELAWARE RIVER AT HANCOCK, DELAWARE COUNTY, N. Y.

The Delaware River originates on the slope of Mine Mountain near the southwestern line of Schoharie County, flows southwesterly across central Delaware County to Deposit, where it is joined by Oquaga Creek, a large tributary draining eastern Broome County. The upper drainage area is relatively long and narrow, with numerous short lateral tributaries. It is precipitous, and to a large extent wooded. At Deposit, the stream turns abruptly to the southeast, forming the boundary line between New York and Pennsylvania until Port Jervis is reached. Here it encounters the foot of Shawangunk Range, and its direction of flow is again turned to the southwest. Below Port Jervis, the Delaware forms the division between Pennsylvania and New Jersey, and ultimately debouches into Delaware Bay below Philadelphia. Above Hancock, the main stream is known as the West Branch of Delaware River,[a] to distinguish it from the smaller East or Pepacton branch of Delaware River.

The gauging station on West Branch Delaware River is situated at the suspension bridge in Hancock Village. A weight and wire gauge, reading decimally to fifteen feet, is attached to the upstream side of the bridge. The stream bed is of rock, overlaid with gravel and cobblestone.

The bench mark is a circular chisel draft on the upstream corner of the left-hand abutment.

Elevation bench mark..................................	100.00
Elevation of water surface when gauge reads zero.......	75.75

The gauge was erected October 15, 1902, by P. M. Churchill and C. C. Covert.

The gauge is read each day at 8 a. m. and again at 4 p. m. by David Pulver, collector of tolls at the bridge.

The gauging station is situated approximately one-half mile upstream from the junction of the East and West branches of the stream. The bridge has a span between abutments of 235 feet.

Current-meter Discharge Measurements of West Branch, Delaware River, at Hancock, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1902.			
October 15	P. M. Churchill	8.95	1,123
1903.			
February 12	F. H. Tillinghast	5.80	4,782
March 25	F. H. Tillinghast	6.40	6,393
May 4	F. H. Tillinghast	2.75	868
May 16	E. C. Murphy	2.51	155
May 28	F. H. Tillinghast	2.55	184
July 21	F. H. Tillinghast	3.10	406
August 31	F. H. Tillinghast	5.34	299

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[a] Sometimes called Mohawk. It should not be confused with the Mohawk River, a tributary of Hudson River.

Mean Daily Gauge Height, Feet, of West Branch, Delaware River, at Hancock, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	3.80	5.75	8.40	4.65	2.62	2.18	4.05	2.98	4.84	2.54	3.68	5.08
2	3.70	5.20	5.75	4.40	2.70	2.30	3.75	2.75	4.49	2.84	3.48	5.28
3	4.30	5.85	5.25	4.50	2.55	2.28	3.45	2.65	4.19	2.59	3.48	4.43
4	4.85	5.68	4.70	4.10	2.70	2.26	3.25	2.80	4.04	2.64	3.43	3.98
5	4.40	5.95	4.55	4.00	2.70	2.02	3.05	3.60	3.74	2.87	3.48	4.08
6	4.15	5.30	4.75	3.90	2.70	2.20	3.10	3.58	3.54	3.09	3.46	4.88
7	3.95	4.75	4.55	4.05	2.60	2.20	2.90	3.85	3.39	3.04	3.43	4.83
8	3.95	4.50	4.65	4.55	2.70	2.25	2.90	3.40	3.24	4.04	3.48	3.88
9	3.62	4.30	6.95	4.95	2.65	2.40	2.95	3.45	3.19	9.34	3.33	3.78
10	3.50	4.30	6.15	4.80	2.62	2.50	2.85	3.45	3.19	13.45	3.28	5.68
11	3.55	4.10	7.65	4.72	2.50	2.32	2.75	3.35	3.44	7.74	3.28	4.98
12	3.75	5.60	7.65	4.40	2.55	4.60	2.68	3.25	3.34	6.74	3.23	4.73
13	4.70	5.05	6.00	4.25	2.50	5.28	2.55	3.22	3.24	5.74	3.18	4.23
14	5.15	4.35	5.50	4.05	2.55	4.85	2.55	3.00	3.09	5.21	3.18	5.07
15	5.40	4.15	5.20	4.20	2.55	4.05	2.42	3.00	2.99	4.89	3.08	5.37
16	5.30	4.20	4.75	4.05	2.35	3.85	2.48	2.80	2.99	4.69	3.23	5.02
17	5.50	3.70	4.65	3.75	2.52	3.50	2.42	2.90	3.19	4.59	6.13	4.77
18	5.25	3.50	4.65	3.65	2.55	3.45	2.42	2.88	3.39	5.94	6.16	4.82
19	4.90	3.25	4.35	3.55	2.40	3.40	2.82	2.85	3.29	5.54	5.23	4.32
20	4.75	3.60	4.30	3.45	2.35	3.28	2.82	3.52	3.14	5.14	4.78	4.92
21	5.50	3.95	4.20	3.25	2.40	3.92	3.18	3.45	2.99	4.83	4.88	6.82
22	6.30	3.90	4.75	3.20	2.35	3.88	3.25	3.30	2.64	4.58	4.18	5.22
23	6.30	3.80	6.40	3.20	2.18	3.75	3.65	3.05	2.74	4.38	4.18	4.77
24	5.55	3.75	8.40	3.10	2.20	4.05	3.40	3.05	2.67	4.23	4.13	4.67
25	5.85	3.68	6.55	3.12	2.30	3.90	3.10	3.25	2.64	4.08	3.83	4.47
26	5.85	3.75	5.65	3.00	2.25	3.85	2.92	3.85	2.59	3.93	3.38	3.92
27	5.75	3.50	5.20	3.10	2.22	3.70	2.75	3.64	2.47	3.83	3.63	3.57
28	5.85	3.00	4.68	3.10	2.48	3.50	2.70	3.49	2.79	3.78	3.53	3.62
29	7.08	......	4.60	3.10	2.32	3.70	2.70	7.44	2.54	3.76	3.53	3.47
30	8.00	......	4.12	3.00	2.25	4.38	2.82	6.24	2.54	3.78	3.93	6.57
31	6.25	......	5.20	......	2.30	......	2.98	5.34	......	3.68	......	6.62

EAST BRANCH DELAWARE RIVER AT HANCOCK, DELAWARE COUNTY, N. Y.

East Branch Delaware River flows parallel to the West Branch across southern Delaware County. The drainage area is broader and the tributaries longer and more branching than those of the West Branch. Many of the tributaries head in small lakes and ponds.

The gauging station is situated at the highway bridge in Hancock Village. A fifteen-foot weight and wire gauge graduated decimally is attached to the horizontal chords of the upstream side of the second span from the left-hand or south abutment. The reference point is a circular chisel draft on the downstream corner of the left-hand abutment. Its elevation referred to the bench mark described above in connection with the station on the west branch of the stream is 98.52.

The elevation of the datum plane of the gauge, or of water surface when the gauge reads zero, is 70.59, or 5.16 feet lower than that for the West Branch station.

The bridge consists of five spans, and has a length between abutments of 425.5 feet. Discharge measurements are usually made from the downstream side.

During low water the topographical elevation of water in the East Branch is lower than that in the West Branch at the respective gauging stations. There is considerable fall in each branch from the gauging station to the mouth of the stream.

The gauge was erected October 14, 1902, by P. M. Churchill and C. C. Covert. The stage of water is read twice daily, at 8 a. m. and 4 p. m., by D. B. Van Etten.

The following table shows the drainage areas of the Upper Delaware River and its principal tributaries:[a]

STREAM AND LOCATION.	Square miles.
Delaware River, at mouth	10,000
Delaware River, at Lambertsville, N. J	6,820
Delaware River, at Port Jervis below mouth of Neversink River	3,600
Delaware River at Port Jervis above mouth of Neversink River	3,254
Neversink River at mouth	346
Lackawaxen River at mouth	597
Mongaup Creek at mouth	231
Delaware River below junction of branches at Hancock, N. Y	1,604
West Branch Delaware River above mouth at Hancock, N. Y	685
West Branch Delaware River above Oquaga Creek at Deposit, N. Y	519
West Branch Delaware River at Walton, N. Y	348
East Branch Delaware River at mouth, Hancock, N. Y	919

The drainage area of Delaware River above Port Jervis lies about four-fifths in New York and one-fifth in Pennsylvania.

A gauging station was established on Lower Delaware River at Lambertsville, N. J., June 23, 1897, by E. G. Paul.[b]

Current-meter Discharge Measurements of East Branch, Delaware River, at Hancock, N. Y

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1902.			
October 14	P. M. Churchill	4.34	2,320
1903.			
February 12	F. H. Tillinghast	6.18	7,394
March 26	F. H. Tillinghast	5.99	6,578
May 5	F. H. Tillinghast	3.18	691
May 16	E. C. Murphy	2.98	514
May 29	F. H. Tillinghast	2.70	292
July 21	F. H. Tillinghast	3.62	1,255
September 1	F. H. Tillinghast	4.95	3,871

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[a] From Report on Water Power, 10th U. S. Census, Vol. XVI, pp. 607-639.

[b] Results are given in Water Supply and Irrigation Paper, U. S. Geological Survey No. 65, p. 214.

Mean Daily Gauge Height, Feet, of East Branch, Delaware River, at Hancock, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	3.85	5.09	10.94	4.79	3.18	2.62	4.02	3.25	4.89	2.79	3.63	4.38
2	3.80	4.89	6.34	4.54	3.16	2.57	3.77	3.08	4.51	2.91	3.58	4.23
3	4.30	5.24	5.59	4.44	3.10	2.57	3.59	3.00	4.24	2.97	3.50	4.40
4	4.75	5.29	5.19	4.53	3.10	2.57	3.45	3.05	4.04	2.89	3.48	4.13
5	4.35	5.99	4.94	4.48	3.16	2.52	3.35	4.35	3.84	2.87	3.56	4.00
6	4.20	5.24	4.89	4.23	3.08	2.52	3.29	4.08	3.71	2.97	3.88	3.93
7	4.04	4.89	4.84	4.28	3.00	2.52	3.25	4.30	3.57	3.01	3.70	4.06
8	4.04	4.59	4.94	4.98	3.03	2.62	3.15	4.00	3.47	3.21	3.56	3.86
9	3.69	4.44	7.59	5.98	2.98	2.75	3.07	3.72	3.39	13.94	3.53	3.78
10	3.59	4.29	6.84	5.63	2.98	2.77	3.05	3.82	3.37	14.24	3.53	3.98
11	3.64	4.19	8.54	5.23	2.93	3.15	3.02	3.70	3.41	8.19	3.48	4.33
12	3.94	6.19	7.69	4.93	2.90	7.12	2.97	3.80	3.34	6.51	3.48	4.48
13	4.24	5.29	6.61	4.73	2.88	6.77	2.92	3.65	3.21	5.69	3.48	4.58
14	4.69	4.94	6.09	4.53	2.86	5.12	2.92	3.48	3.14	5.19	3.40	5.47
15	4.89	4.64	5.84	5.03	3.20	5.02	2.89	3.38	3.09	4.84	3.38	5.07
16	4.89	4.54	5.64	4.53	2.96	4.62	2.95	3.30	3.01	4.61	3.43	4.72
17	4.84	4.24	5.24	4.33	2.88	4.35	2.89	3.45	3.09	4.47	5.23	4.52
18	4.59	3.64	5.04	4.13	2.83	4.19	2.92	3.32	3.67	5.21	6.83	4.37
19	4.29	3.84	4.89	4.03	2.83	3.99	3.12	3.22	3.44	5.07	5.56	4.07
20	4.29	4.14	4.89	3.93	2.78	3.92	3.07	3.30	3.21	4.74	5.08	4.17
21	4.54	4.19	4.79	3.83	2.78	4.37	3.70	3.35	3.09	4.53	4.70	7.57
22	5.04	4.14	6.24	3.73	2.73	5.05	3.40	3.22	3.04	4.38	4.50	5.72
23	4.54	4.04	6.64	3.68	2.70	4.59	5.10	3.18	2.99	4.28	4.38	5.07
24	4.69	4.94	9.29	3.63	2.68	4.79	4.12	3.10	2.97	4.20	4.30	4.85
25	6.59	3.74	6.94	3.56	2.68	4.69	3.72	3.18	2.89	4.10	4.13	4.57
26	6.94	3.84	5.99	3.48	2.68	4.47	3.45	3.78	2.89	3.98	3.88	4.39
27	6.69	3.79	5.39	3.40	2.68	4.22	3.30	3.49	2.87	3.90	4.68	3.87
28	6.19	7.24	5.04	3.38	2.70	4.02	3.18	3.37	2.89	3.86	4.76	4.17
29	6.34	......	4.74	3.30	2.68	3.95	3.12	7.14	2.91	3.80	4.63	4.09
30	7.49	......	4.54	3.26	2.68	4.29	3.25	6.29	2.84	3.76	4.58	4.47
31	5.74	......	5.14	......	2.68	......	3.38	6.37	......	3.70	......	4.57

SUSQUEHANNA RIVER DRAINAGE IN NEW YORK.

The Susquehanna River drains an irregular triangular area extending from the Pennsylvania Line northerly, the northern divide separating its drainage from that of Mohawk River and the Oneida-Seneca River system.

Chenango and Susquehanna Rivers unite at Binghamton. Chenango River is further sub-divided at Chenango Forks, where it receives Tioughnioga River. Susquehanna River has a similar westerly branch in Unadilla River. The area is characterized by long, nearly parallel tributaries flowing southerly into the main stream. These in turn are fed by similar tributaries with small ramifying branches; the entire area being thoroughly and uniformly drained through the resulting network of small feeders. The soil is clay and gravel, underlaid successively by sedimentary rocks, of Chemung, Ithaca and Hamilton series, proceeding upstream.

There are few lakes and but little surface storage in the drainage basin; Otsego Lake at the head of Susquehanna River being the largest water area. The drainage basin is a rich agricultural region, largely under cultivation, but with a moderate percentage of woodland in small patches, also occasional swamp and springy areas.

The gauging stations on Chenango and Susquehanna Rivers, described below, are located just above the juncture of the two streams. By combining the monthly mean discharge, the total discharge of Susquehanna River below the inflow of Chenango River has been obtained, as given in the following table.

Additional data, relative to the discharge of Susquehanna River below Chenango River is contained in Report on Stream Gaugings, Supplement, Report of State Engineer and Surveyor of New York for 1902; pp. 314 and 315.

Estimated Monthly Discharge of Susquehanna River, Binghamton, N. Y., Including Chenango River. [a]

[Drainage area, 3,934 square miles.]

MONTH.	Discharge in second-feet, mean.	RUN-OFF.		Rainfall, inches.
		Second-feet per square mile.	Depth in inches.	
1901.				
January	....	....	....	....
February	....	....	....	....
March	....	....	....	....
April	....	....	....	....
May	....	....	....	....
June	....	....	....	....
July	....	....	....	....
August	2,026	.51	.59	....
September	1.523	.38	.42	....
October	1,831	.46	.53	....
November	2,658	.68	.76	....
December	12,231	3.11	3.59	....
August to December	....	....	....	17.80
1902.				
January	5,151	1.31	1.51	....
February	3,405	.86	.89	....
March	31,418	8.01	9.24	....
April	8,328	2.12	2.37	....
May	2,989	.76	.88	....
June	4,194	1.07	1.19	....
July	15,602	3.97	4.58	....
August	4,957	1.26	1.45	....
September	2,220	.56	.62	....
October	6,410	1.63	1.88	....
November	4,732	1.20	1.34	....
December	11,860	3.02	3.48	....
The year	....	....	29.43	43.17

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[a] Combined flow of Susquehanna and Chenango Rivers at Binghamton.

Estimated Monthly Discharge of Susquehanna River, Binghamton, N. Y., Including Chenango River.[a]—(Concluded.)

MONTH.	Discharge in second-feet, mean.	RUN-OFF.		Rainfall, inches.
		Second-feet per square mile.	Depth in inches.	
1903.				
January	14,623	3.72	4.29	....
February	14,545	3.70	5.18	....
March	27,366	6.97	8.04	....
April	8,547	2.17	2.42	....
May	1,408	.35	.40	....
June	4,393	1.12	1.25	....
July	2,962	.75	.86	....
August	7,235	1.84	2.12	....
September	4,323	1.10	1.23	....
October	16,352	4.16	4.80	....
November	6,286	1.60	1.79	....
December	5,451	1.39	1.60	....
The year	....	....	33.98	44.11

Drainage Areas of Susquehanna and Chenango Rivers.[b]

LOCATION.	Square miles.
Susquehanna above Oneonta	686
Susquehanna above mouth, Unadilla River	914
Unadilla River above junction with Susquehanna	565
Susquehanna River below mouth Unadilla River	1,479
Susquehanna River, total drainage in New York, above Chenango River	1,900
Susquehanna River, drainage in Pennsylvania above Chenango River	500
Susquehanna River, total above Chenango River	2,400
Chenango River above Chenango Forks	694
Tioughnioga River above junction with Chenango River	753
Chenango River below mouth Tioughnioga River	1,447
Chenango River above mouth	1,582
Susquehanna River below junction of Chenango River	3,982

CHENANGO RIVER AT BINGHAMTON, BROOME COUNTY, N. Y.

A gauging station was established at Court Street Bridge, Binghamton, July 31, 1901.

Court street bridge stands squarely across the thread line of the stream 2,500 feet above its mouth. It is also located below a low rock dam at Binghamton. The gauging section has a smooth bed of gravel divided by three masonry piers supporting the four spans of the bridge, which have 79 feet clear width each, the length of the bridge between abutments being 337 feet. During low water, a small rift exists below the gauging station, cutting off backwater from Susquehanna River.

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[a] Combined flow of Susquehanna and Chenango Rivers at Binghamton.
[b] From Bien's Atlas of N. Y. State.

For periods during freshets or at times when there is an abnormal rise in one stream not accompanied by a similar rise in the other stream, either the Chenango or Susquehanna River record at Binghamton may be affected by backwater, thereby indicating a too great discharge. For freshets of considerable duration, the flow of the two streams will be more nearly equalized.

Gauge readings on Chenango River, as well as those on Susquehanna River at Binghamton, are taken by E. F. Weeks.

In estimating run-off of Chenango River, the area directly tributary to storage reservoirs from which diversion is made to supply Erie Canal has been deducted from the total area naturally tributary to Chenango River as follows:

		Square miles.
Natural tributary area[a]		1,582.00
Diversion area 6 reservoirs at head of Chenango River whose overflow is turned into Erie Canal through Oriskany Creek	30.36	
Diversion area DeRuyter reservoir at head Tioughnioga River, outflow turned into Erie Canal through Limestone Creek	18.15	
		48.51
Net area used for Chenango basin		1,534

Above estimate of diversion area approximate. No allowance for direct inflow to feeder channels from additional areas nor for waste into original stream. Gross area, from which more or less run-off is diverted is about 105 square miles.

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[a] From Bien's Atlas of N. Y. State. Areas tributary to reservoirs are from N. Y. Barge Canal Report, 1900.

List of Discharge Measurements of Chenango River, Binghamton, N. Y.

DATE.		Hydrographer.	Gauge height, feet. *a*	Discharge, *a* second-feet.
	1901.			
July	2	E. C. Murphy	5.64	848
July	8	E. C. Murphy	5.78	1,119
July	9	E. C. Murphy	5.71	942
July	29	E. C. Murphy	5.21	405
July	29	E. C. Murphy	5.21	425
August	19	E. C. Murphy	5.48	566
August	19	E. C. Murphy	5.49	577
October	19	E. C. Murphy	5.81	987
October	19	E. C. Murphy	5.82	927
	1902.			
March	27	E. C. Murphy	8.15	4,201
March	28	E. C. Murphy	8.21	4,377
March	29	E. C. Murphy	8.75	5,205
June	6	R. E. Horton	7.00	*b* 2,407
July	1	E. C. Murphy	8.49	4,815
July	8	E. C. Murphy	7.24	2,688
July	15	E. C. Murphy	6.64	2,098
August	3	E. C. Murphy	9.16	5,543
August	14	E. C. Murphy	6.32	1,605
August	15	E. C. Murphy	6.20	1,341
September	3	C. C. Covert	5.56	516
	1903.			
April	6	E. C. Murphy	7.72	3,695
May	15	E. C. Murphy	5.49	538
June	3	C. C. Covert	8.06	2,877
August	19	J. C. Hoyt	5.62	601
August	21	C. C. Covert	6.72	2,243
October	1	H. H. Halsey	5.51	709
October	10	C. C. Covert	19.81	28,300

Mean Daily Discharge, Second-Feet, of Chenango River, Binghamton, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.*c*												
1	......	......	......	......	......	......	......	328	730	880	592	1,400
2	......	......	......	......	......	......	......	270	940	640	448	1,656
3	......	......	......	......	......	......	......	256	730	640	400	2,024
4	......	......	......	......	......	......	......	256	640	850	424	1,916
5	......	......	......	......	......	......	......	208	568	700	400	1,496
6	......	......	......	......	......	......	......	352	424	640	400	1,180
7	......	......	......	......	......	......	......	208	376	592	400	1,120
8	......	......	......	......	......	......	......	256	352	616	376	1,272
9	......	......	......	......	......	......	......	352	328	544	376	1,336
10	......	......	......	......	......	......	......	352	304	520	352	4,325
11	......	......	......	......	......	......	......	376	304	496	270	7,500
12	......	......	......	......	......	......	......	352	328	472	400	5,402
13	......	......	......	......	......	......	......	328	448	568	2,384	......
14	......	......	......	......	......	......	......	270	616	1,848	1,816	4,812
15	......	......	......	......	......	......	......	304	496	1,752	1,496	27,630
16	......	......	......	......	......	......	......	1,688	568	1,336	1,368	23,202
17	......	......	......	......	......	......	......	1,120	700	1,120	1,368	12,450
18	......	......	......	......	......	......	......	760	790	1,060	1,304	6,420
19	......	......	......	......	......	......	......	616	700	1,000	1,304	4,250
20	......	......	......	......	......	......	......	544	592	1,030	1,240	3,200
21	......	......	......	......	......	......	......	700	592	970	1,180	2,384
22	......	......	......	......	......	......	......	730	448	940	1,180	2,096
23	......	......	......	......	......	......	......	616	376	880	1,180	2,975
24	......	......	......	......	......	......	......	2,168	352	820	2,168	4,862
25	......	......	......	......	......	......	......	1,496	400	730	3,762	3,210
26	......	......	......	......	......	......	......	820	400	616	2,862	2,480
27	......	......	......	......	......	......	......	520	400	592	2,060	2,348
28	......	......	......	......	......	......	......	448	......	544	1,304	1,880
29	......	......	......	......	......	......	......	400	304	544	1,496	1,916
30	......	......	......	......	......	......	......	352	1,090	496	1,656	2,900
31	......	......	......	......	......	......	......	352	......	544	......	3,125
Mean	......	......	......	......	......	......	......	574	527	806	1,199	4,740

a Referred to original gauge datum.
b Rough measurement.
c Discharge under 800 second-feet subject to revision.

Mean Daily Discharge, Second-Feet, of Chenango River, Binghamton, N. Y.
(Continued).

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1902.*a*												
1	2,060	1,624	25,700	5,105	1,952	1,560	4,978	4,775	730	3,012	4,175	1,952
2	2,096	1,560	35,950	5,020	1,656	1,400	3,912	6,510	700	2,975	3,425	1,848
3	2,240	1,400	33,090	4,775	1,528	1,240	3,200	4.812	700	2,126	2,975	2,126
4	2,456	1,688	22,470	4,250	1,528	1,592	3,238	3,838	616	1,592	2,564	2,975
5	2,096	1,496	12,850	3,838	1,528	2,600	2,788	3,088	592	1,304	2,384	2.825
6	2,024	1,496	7,455	......	1,400	2,060	3,275	2,600	592	1,592	2,240	2,240
7	1,916	1,432	6,150	3,500	1,400	1,688	4,400	2,638	616	1,952	2,168	2,024
8	1,624	1,496	5,745	3,462	1,400	1,688	4,100	2,420	592	1,816	3,462	1,880
9	1,528	1,496	5,148	4,288	1,400	1,720	3,800	2.312	616	1,816	1,816	1,560
10	1,400	1.836	6,510	4,850	1,240	1,688	3.912	1,988	1,060	1,624	1,688	1,464
11	1,432	1,868	6,195	5,658	1,210	1,496	6,105	1,916	1,336	1,432	1,592	1,952
12	1,272	1,210	10,490	5,318	1,150	1,720	4,700	2,276	1,000	1,432	1,560	1,952
13	1,090	1,120	17,558	4,812	1,090	1,624	3,200	2,204	820	1,432	1,848	1,560
14	1,090	1,060	19,041	4,438	1,030	1,688	2,528	1,752	760	1,688	1,752	1,240
15	1,120	970	15,668	3,800	970	1,560	2,126	1,560	700	2,096	1,624	1,368
16	1,120	1,060	11,202	3,238	910	1,528	1,952	1,528	592	1,624	1,432	1,304
17	1,090	940	19,202	2,862	940	1,560	1,952	1,368	544	1,368	1,368	8,448
18	940	970	18,934	2,675	910	1,432	1,848	1,304	496	1,240	1,336	9,255
19	970	940	13.450	2,456	790	1,304	2,312	1,240	496	1,180	1,304	7,320
20	970	880	8,355	2,312	970	1,304	10,015	1,240	448	2,312	1,368	5,835
21	820	820	6,420	2,204	1,304	1,272	17,452	880	424	2,384	1,304	4,850
22	1,272	850	6,060	2,096	1,150	1,592	17,452	1,240	400	1,880	1,336	12,950
23	4,475	850	6,285	1,916	1,030	1,656	14,302	1,120	448	1,688	1,336	15,352
24	5,105	820	6,375	1,752	970	1.432	11,950	1,090	424	1,624	1,432	9,872
25	3,538	850	5,615	1,656	1,240	1,240	10,252	1,000	448	1,624	1,496	6,240
26	2,384	910	4,812	1,496	1,688	1,304	6,825	1,000	700	1,496	1,592	5,190
27	2,384	1,336	4,325	1,496	2,060	1,464	5,062	880	940	1,432	2,276	4,475
28	3,012	5,572	4,325	1,432	1,688	1,432	10,538	970	820	6,240	2,675	3,575
29	3,200	......	5,615	1,432	1,560	2,204	6,960	940	3,575	10,680	2,276	2,975
30	2,384	......	6,195	1,624	1,528	8,495	5,062	940	1,816	8,220	2,024	3,012
31	1,752	......	5,658	......	1,496	......	6,240	820	......	5,615	......	2,564
Mean	1,963	1,341	11,704	3,233	1,313	1,818	6.014	2,009	800	2,210	1,994	4,264
1903. *a*												
1	2,240	11,350	20,600	7,770	1,000	208	2,024	730	7,500	640	2,420	1,528
2	2,096	8,590	16,035	5,970	940	256	1,784	670	5,105	700	2,204	1,336
3	2,900	8,495	9,682	4,935	940	256	1,400	592	3,838	1,000	2,126	1,496
4	5,318	11,155	6,960	4,850	880	208	1,210	592	3,050	1,030	1,952	1,496
5	5,105	14,000	5,790	4,475	850	208	1,120	1,988	2,528	1,030	1,880	1,432
6	4,025	10,205	7,770	3,762	820	208	1,030	1,880	2,096	3,088	2,492	1,400
7	3,125	7,140	7,500	3,575	760	136	1,060	1,848	1,816	2,168	2,348	1,336
8	2,975	4,935	7,635	5,275	730	400	970	1,656	1,624	2,096	1,988	1,304
9	2,564	4,325	16,718	5,880	700	256	850	1,240	1,496	11,155	1,848	1,304
10	6,690	3,875	15,878	4,935	700	208	730	1,528	1,400	26,420	1,752	1,120
11	6,330	3,725	17,925	4,362	700	256	616	1,916	1,688	28,540	1,752	1,120
12	6,330	5,700	17,925	3,800	640	880	616	1,592	1,880	18,398	1,656	1,240
13	6,150	7,950	13,550	3,350	640	4,062	568	1,592	1,496	10,158	1,560	1,624
14	5,835	6,195	9,920	2,975	616	2,060	568	1,336	1,272	6,510	1,528	1,688
15	5,970	4,400	7,950	3,312	592	1,624	568	1,180	1,150	4,978	1,432	1,432
16	5,970	3,875	6,690	3,200	592	1,400	640	1,000	1,120	4,025	1,432	1,368
17	5,615	2,975	5,835	2,900	592	1,150	730	880	1,060	3,762	5,745	1,368
18	4,935	1,816	5,970	2,564	544	910	640	880	1,496	10,395	7,680	1,304
19	3,875	2,126	5,318	2,240	520	940	910	760	1,528	10,728	4,850	1,150
20	3,162	2,168	4,625	1,952	496	1,030	1,120	2,712	1,240	7,860	3,238	1,210
21	3,725	2,420	4,325	1,816	496	2,060	1,000	2,456	1,120	5,835	2,492	3,125
22	7,230	2,312	6,555	1,688	496	5,148	1,090	1,624	1,000	4,700	2,240	4,625
23	7,230	2,456	10,062	1,624	400	4,400	2,126	1,240	880	3,912	2,204	4,250
24	5,190	2,240	18,934	1,560	400	5,700	2,825	1,000	880	3,688	2,384	3,312
25	4,062	2,126	17,295	1,368	400	4,588	1,868	1,000	820	3,425	2,276	3,125
26	4,025	2,096	12,350	1,368	352	3,912	970	3,538	760	2,975	1,752	2,862
27	3,575	1,952	8,495	1,304	352	3,012	820	3,500	700	2,825	1,656	2,492
28	3,650	7,410	6,690	1,180	352	2,276	730	2,456	760	2,750	1,720	1,848
29	5,275	......	5,970	1,090	400	2,168	730	16,560	760	2,900	1,464	1,848
30	13,850	......	5,020	1,060	352	2,456	820	16,035	760	2,862	1,496	1,880
31	14,775	......	7,095	......	304	......	760	11,450	......	2,750	......	1,816
Mean	5,284	5,286	10,099	3,205	598	1,746	1,045	2,820	1,761	6,236	2,385	1,885

a Discharge under 800 second-feet subject to revision.

Estimated Monthly Discharge of Chenango River, Binghamton, N. Y.

[Drainage area, 1,534 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.		Rainfall—inches.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	
1901.						
January	....	....	....	....	....	....
February	....	....	....	....	....	....
March	....	....	....	....	....	....
April	....	....	....	....	....	....
May	....	....	....	....	....	....
June	....	....	....	....	....	....
July	....	....	....	....	....	....
August	2,168	208	574	.38	.44	3.84
September	1,090	304	527	.34	.38	2.98
October	1,848	472	806	.53	.61	1.98
November	3,762	270	1,199	.78	.87	3.16
December	27,630	1,120	4,740	3.10	3.57	5.64
The year	....	....	....	....	5.87	40.68
1902.						
January	5,105	820	1,963	1.29	1.49	1.52
February	5,572	820	1,341	.88	.91	3.07
March	35,950	4,325	11,704	7.65	8.82	3.69
April	5,658	1,432	3,233	2.11	2.35	1.51
May	2,060	790	1,318	.86	.99	2.74
June	8,495	1,240	1,818	1.19	1.33	6.14
July	17,452	1,848	6,014	3.93	4.53	7.88
August	6,510	880	2,009	1.31	1.51	2.89
September	3,575	400	800	.52	.58	3.56
October	10,680	1,180	2,210	1.44	1.66	4.26
November	4,175	1,304	1,994	1.30	1.45	1.23
December	15,352	1,240	4,264	2.79	3.22	4.80
The year	....	....	....	....	28.84	43.30
1903.						
January	14,775	2,096	5,284	3.45	3.98	2.91
February	14,000	1,952	5,286	3.46	3.60	2.49
March	20,600	4,325	10,099	6.60	7.61	4.77
April	7,770	1,060	3,205	2.10	2.34	1.56
May	1,000	304	598	.39	.45	0.24
June	4,062	136	1,746	1.14	1.27	7.82
July	2,825	568	1,045	.68	.78	3.45
August	16,560	592	2,820	1.84	2.12	6.88
September	7,500	700	1,761	1.15	1.28	1.66
October	28,540	640	6,236	4.08	4.70	3.10
November	7,680	1,432	2,385	1.56	1.74	2.12
December	4,625	1,120	1,885	1.23	1.42	3.26
The year	....	....	....	....	31.29	42.68

MISCELLANEOUS GAUGINGS, CHENANGO RIVER DRAINAGE BASIN.

Records of the flow of Eaton and Madison Brooks, two small streams near the headwaters of Chenango River, are among the earliest, if not the first systematic stream gaugings in the United States. The flow of these streams was determined by John B. Jervis in 1835 in an investigation of water supply for the summit level of the Chenango Canal, extending from Utica to Binghamton and now abandoned.

The headwaters of Chenango River, including Eaton and Madison Brooks, and the storage reservoirs which have been constructed to supply the summit level of Erie Canal through Oriskany Creek, are shown on the Morrisville, Cazenovia, Norwich and Pitcher quadrangles Nos. 104, 93, 105 and 94 of the U. S. Geol. Survey Topographic map.

Eaton Brook drainage basin is from 1½ to 3 miles in width and 7 miles in length. It contains near its head, Eaton Reservoir at elevation about 1,430 feet. The slopes are steep; the soil close textured with shale near the surface. Tributaries are few, and the fall is rapid.

The soil and topography of Madison Brook are similar, the area consisting of rounded hill slopes with a somewhat more porous soil, greater breadth, and more tributaries than in the Eaton Brook area.

It is stated that the Eaton and Madison Brook gaugings show only the volume of water passed downstream from the reservoirs.

Estimated Monthly Discharge of Eaton Brook, Madison County, N. Y.
[Drainage area, 10.62 square miles.]

MONTH.	Discharge in second-feet, mean.	RUN-OFF.		Rainfall, inches.
		Second-feet per square mile.	Depth in inches.	
1835.				
January	....	....	....	....
February	....	....	....	....
March	....	....	....	....
April	....	....	....	....
May	....	....	....	....
June	22.15	2.08	2.32	6.72
July	10.46	.98	1.13	2.74
August	5.06	.48	.55	2.86
September	3.70	.35	.39	1.34
October	7.73	.73	.84	3.00
November	9.17	.86	.96	2.20
December	12.89	1.21	1.39	.96
The year	....	....	7.58	19.82
Per cent Run-off	....	....	....	.38

Estimated Monthly Discharge of Madison Brook, Madison County, N. Y.
[Drainage area, 9.37 square miles.]

MONTH.	Discharge in second-feet, mean.	RUN-OFF.		Rainfall, inches.[a]
		Second-feet per square mile.	Depth in inches.	
1835.				
January	8.66	.93	1.07	2.17
February	10.49	1.12	1.16	2.50
March	16.16	1.73	1.99	1.08
April	31.16	3.33	3.71	5.00
May	21.66	2.32	2.67	1.98
June	7.77	.83	.93	3.05
July	8.64	.92	1.06	3.87
August	8.86	.95	1.10	3.06
September	7.39	.79	.88	.88
October	7.30	.78	.90	3.86
November	7.03	.75	.84	2.10
December	7.24	.77	.89	.76
The year	....	....	17.20	39.26
Per cent Run-off	....	....	....	.44

An examination was made of the diversion from Chenango River drainage basin to supply Erie Canal during September, 1903.

Proceeding upstream from along the feeder which enters Oriskany Creek at Solsville, the draft from the storage reservoirs was observed as follows:

Leland Ponds, well drawn down, September 11, 1903, outflow about 9 second-feet.

Chenango Feeder above inflow from Leland Ponds, September 11, 1903, about 30 second-feet.

Approximate total diversion, 39 second-feet.

The outflow from the several reservoirs proceeding upstream was approximately as follows:

Madison Reservoir, September 11, 1903, 10 second-feet.

Flow in Chenango Feeder at first bridge above Hamilton, also above Madison Reservoir Outlet, about 23 second-feet.

The outflow from the remaining reservoirs in the Chenango River area, Kingsley, Bradley Brook, and Eaton Reservoirs, respectively, was slight. Their combined outflow passes a diverting dam above Randalsville, the waste from which, together with waste and seepage from the feeder, enters the natural channel of Chenango River. The flow in this river channel at the bridge above Earlville September 12, 1903, was approximately 44 second-feet.

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[a] Snow of November and December, 1834, on ground.

Mean Daily Gauge Height, Feet, of Chenango River, at South Oxford, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	......	......	......	......	.85	1.80	......
2	......	......	......	......	......	......	......	......	......	.85	1.70	......
3	......	......	......	......	......	......	......	......	......	1.00	1.70	......
4	......	......	......	......	......	......	......	......	......	.90	1.60	......
5	......	......	......	......	......	......	......	......	......	1.35	1.65	......
6	......	......	......	......	......	......	......	......	......	1.80	1.75	......
7	......	......	......	......	......	......	......	......	......	1.45	1.65	......
8	......	......	......	......	......	......	......	......	......	1.65	......	......
9	......	......	......	......	......	......	......	......	......	4.35	......	......
10	......	......	......	......	......	......	......	......	......	7.40	......	......
11	......	......	......	......	......	......	......	......	......	6.50	......	......
12	......	......	......	......	......	......	......	......	......	4.55	......	......
13	......	......	......	......	......	......	......	......	......	3.65	......	......
14	......	......	......	......	......	......	......	......	......	2.90	......	......
15	......	......	......	......	......	......	......	......	......	2.55	......	......
16	......	......	......	......	......	......	......	......	......	2.30	......	......
17	......	......	......	......	......	......	......	......	......	2.35	......	......
18	......	......	......	......	......	......	......	......	......	4.90	......	......
19	......	......	......	......	......	......	......	......	......	4.30	......	......
20	......	......	......	......	......	......	......	......	......	3.40	......	......
21	......	......	......	......	......	......	......	......	......	2.90	......	......
22	......	......	......	......	......	......	......	......	......	2.55	......	......
23	......	......	......	......	......	......	......	......	......	2.40	......	......
24	......	......	......	......	......	......	......	......	......	2.20	......	......
25	......	......	......	......	......	......	......	......	......	2.15	......	......
26	......	......	......	......	......	......	......	......	......	2.00	......	......
27	......	......	......	......	......	......	......	......	......	1.90	......	......
28	......	......	......	......	......	......	......	......	......	1.95	......	......
29	......	......	......	......	......	......	......	......	.90	1.95	......	......
30	......	......	......	......	......	......	......	......	.85	1.90	......	......
31	......	......	......	......	......	......	......	......	......	1.85	......	......

A temporary board gauge was attached to the upstream side of the left-hand abutment of the highway bridge across Chenango River at South Oxford, N. Y., September 29, 1903, and observations of the stream stage were taken twice daily from that date until November 7, 1903. The obtaining of the desired data relative to low-water flow, was precluded by the occurrence of heavy rains. The precipitation during the period of observation, as recorded at Oxford, is given below:

Precipitation at Oxford, N. Y., in Inches.

	Depth.
1908.	
September 1-10	T
September 11	.64
September 17	.72
September 27-28	.16
October 5	1.14
October 8-12	3.71
October 16-19	1.72
October 23-27	.49
November 5	.34
November 6-15	.12

South Oxford is located 18 miles above the inflow of Tioughnioga River. The drainage area is 453 square miles gross, or 423 square miles net, excluding 30 square miles tributary to the reservoirs which supply Erie Canal summit level during the navigation period.

Mean Daily Gauge Height, Feet, of Tioughnioga River, at Chenango Forks, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1										1.12	2.15	
2										1.20	1.95	
3										1.45	2.00	
4										1.22	1.95	
5										1.50	1.90	
6										2.45	2.05	
7										1.90	2.00	
8										2.10	1.95	
9										4.00	1.90	
10										*	1.90	
11										*		
12										4.30		
13										3.15		
14										2.80		
15										3.38		
16										3.35		
17										3.40		
18										4.50		
19										3.65		
20										3.10		
21										2.70		
22										2.45		
23										2.45		
24										2.45		
25										2.32		
26										2.30		
27										2.20		
28										2.15		
29										2.25		
30										2.25		
31										2.20		

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* Above gauge.

The highway bridge stands at right angles to the thread of the stream which is located across a straight section of channel and affords an excellent opportunity for gauging the discharge, excepting during extreme high-water. A current-meter measurement by C. C. Covert, September 11, 1903, gave the discharge 568 second-feet. Approximate gauge height 1.2 feet.

Water power dams are located along the stream at various points.

A temporary board gauge was attached to the right-hand face of the center pier of the highway bridge across Tioughnioga River at Chenango Forks, September 30, 1903, and readings of the stream stage were taken twice daily, October 1, to November 10, 1903. The desired data of low-water flow could not be obtained, owing to rainfall which occurred during the period of record, as noted in the following table:

Rainfall at De Ruyter, N. Y., 1903.

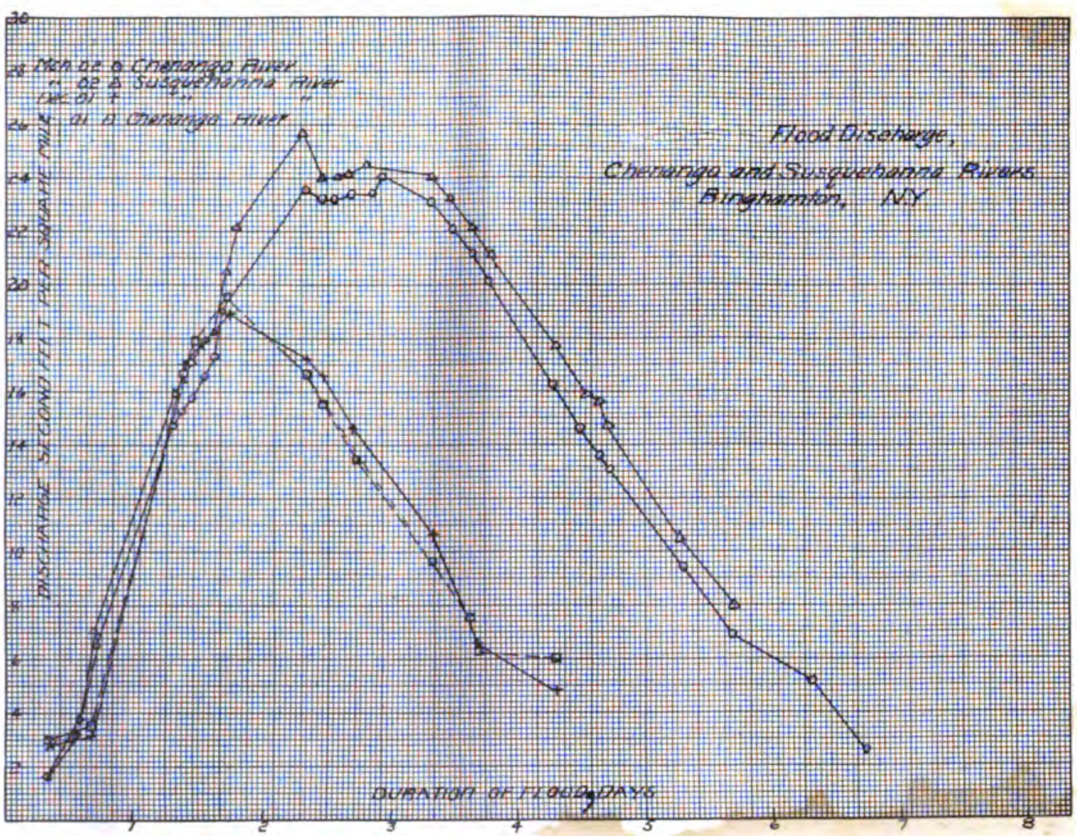
DATE.	Inches.	DATE.	Inches.
September 1-10	.0	October 8-11	8.00
September 11	.96	October 16-19	1.38
September 17-18	.71	October 23-28	.39
September 27	.40	November 5	.34
October 1- 2	.71	November 6-15	.12
October 5	.99		

Current-meter discharge measurements of Tioughnioga River at Chenango Forks were made as follows:

September 11, 1903, by C. C. Covert, discharge 992 second-feet, gauge height 2.0.

September 30, 1903, by H. H. Halsey, discharge 358 second-feet, gauge height 1.2.

The drainage area is 735 square miles above the mouth of the stream at Chenango Forks, excluding the areas naturally tributary to Tioughnioga River, but now diverted to the supply of Erie Canal through Erieville and De Ruyter Reservoirs.



Flood Discharge, Chenango and Susquehanna Rivers, Binghamton, N. Y., 1903.

SUSQUEHANNA RIVER AT BINGHAMTON, BROOME COUNTY, N. Y.

A gauging station was established at Washington Street Bridge, Binghamton, July 31, 1901.

This bridge is situated about 800 feet upstream from the junction of Chenango and Susquehanna Rivers. A rift extends diagonally across the stream, underneath the bridge. The gauge stands above a stretch of smooth water extending from the crest of the rift to the dam, 2,800 feet upstream, and the gauge readings are unaffected by backwater from Chenango River at ordinary stages. Owing to unfavorable conditions underneath the Washington Street Bridge, discharge measurements are made at Exchange Street Bridge, 1,900 feet upstream.

List of Discharge Measurements of Susquehanna River, Binghamton, N. Y.

DATE.		Hydrographer.	Gauge height, feet.[a]	Discharge, second-feet.
	1901.			
July	3	E. C. Murphy	2.12	947
July	10	E. C. Murphy	2.35	1,425
July	30	E. C. Murphy	1.99	608
August	20	E. C. Murphy	2.05	942
August	20	E. C. Murphy	2.06	689
August	21	E. C. Murphy	4.60	7,244
August	22	E. C. Murphy	3.19	3,752
August	22	E. C. Murphy	2.90	2,983
August	23	E. C. Murphy	2.60	2,176
	1902.			
July	2	E. C. Murphy	4.08	5.839
July	4	E. C. Murphy	3.90	5,230
July	14	E. C. Murphy	2.96	3,064
August	3	E. C. Murphy	5.08	8,633
August	4	E. C. Murphy	4.59	6,902
August	15	E. C. Murphy	2.61	2,105
August	16	E. C. Murphy	2.50	1,920
	1903.			
April	7	E. C. Murphy	4.13	5,946
May	15	E. C. Murphy	2.05	768
May	19	E. C. Murphy	1.96	640
June	13	C. C. Covert	5.25	8,726
August	22	C. C. Covert	2.65	2,572
September	3	C. C. Covert	2.00	948
October	1	H. H. Halsey	2.14	962
October	11	C. C. Covert	16.32	49.707
October	13	C. C. Covert	6.35	14.566

[a] Referred to original gauge datum.

Mean Daily Discharge, Second-Feet, of Susquehanna River, Binghamton, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	......	......	......	......	......	......	......	359	1,184	1,184	851	1,850
2	......	......	......	......	......	......	......	631	1,073	1,184	796	1,850
3	......	......	......	......	......	......	......	486	1,073	1,073	631	2,202
4	......	......	......	......	......	......	......	359	1,184	1,073	631	1,968
5	......	......	......	......	......	......	......	359	1,128	1,073	631	2,202
6	......	......	......	......	......	......	......	359	1,073	851	631	1,739
7	......	......	......	......	......	......	......	359	851	851	631	1,462
8	......	......	......	......	......	......	......	486	851	740	631	1,517
9	......	......	......	......	......	......	......	486	851	851	550	1,739
10	......	......	......	......	......	......	......	359	631	740	631	8,876
11	......	......	......	......	......	......	......	631	676	796	550	11,800
12	......	......	......	......	......	......	......	631	851	631	631	9,261
13	......	......	......	......	......	......	......	486	851	740	1,850	......
14	......	......	......	......	......	......	......	631	740	851	2,908	7,188
15	......	......	......	......	......	......	......	631	906	1,073	2,555	43,015
16	......	......	......	......	......	......	......	631	1,073	1,462	1,968	38,775
17	......	......	......	......	......	......	......	631	1,184	1,628	1,739	22,400
18	......	......	......	......	......	......	......	962	1,517	......	1,684	10,280
19	......	......	......	......	......	......	......	1,073	1,517	1,295	1,517	6,302
20	......	......	......	......	......	......	......	851	1,517	1,295	1,628	4,128
21	......	......	......	......	......	......	......	4,628	1,295	1,295	1,628	2,908
22	......	......	......	......	......	......	......	2,966	1,073	1,295	1,462	2,438
23	......	......	......	......	......	......	......	2,085	851	1,295	1,406	4,880
24	......	......	......	......	......	......	......	6,830	851	1,184	2,320	7,259
25	......	......	......	......	......	......	......	5,132	851	1,073	4,066	5,884
26	......	......	......	......	......	......	......	3,515	851	962	2,908	3,821
27	......	......	......	......	......	......	......	2,496	740	851	1,908	3,638
28	......	......	......	......	......	......	......	1,739	......	851	1,295	2,672
29	......	......	......	......	......	......	......	1,517	796	851	1,517	2,790
30	......	......	......	......	......	......	......	1,295	851	851	1,628	4,751
31	......	......	......	......	......	......	486	1,406	......	851	......	5,642
Mean	......	......	......	......	......	......	......	1,452	996	1,025	1,459	7,491
1902.												
1	3,576	1,968	45,940	8,876	2,672	1,517	8,568	7,974	1,018	7,044	7,116	2,438
2	4,005	1,968	60,400	8,568	2,672	1,572	6,104	11,240	1,018	6,170	5,708	2,378
3	3,576	1,968	54,300	7,902	2,438	1,406	4,502	9,107	1,018	4,691	4,751	2,672
4	4,376	3,638	38,965	6,973	2,202	2,144	5,195	6,830	1,073	3,882	4,188	3,270
5	3,576	2,908	22,220	6,038	2,202	3,208	4,066	4,943	1,018	2,790	3,698	3,821
6	3,392	2,202	12,520	......	2,261	2,672	5,447	4,128	906	2,848	3,331	3,454
7	3,086	2,378	10,120	5,258	2,026	2,144	6,632	3,944	851	2,614	3,208	2,848
8	2,614	2,438	9,338	5,069	1,908	2,026	6,434	3,270	962	2,496	3,025	2,496
9	2,202	2,555	8,414	7,545	1,739	2,202	5,510	2,966	906	2,438	2,614	2,378
10	1,968	2,378	10,600	9,492	1,739	2,085	5,576	2,614	1,295	2,261	2,496	2,672
11	1,908	2,672	10,120	10,440	1,517	1,794	7,616	2,378	1,295	1,968	2,320	2,614
12	1,739	2,202	17,270	9,646	1,462	1,794	6,500	2,438	1,295	2,261	2,202	2,908
13	2,026	1,684	29,420	8,337	1,406	2,026	4,066	2,555	1,240	2,496	2,202	2,614
14	1,739	1,517	32,120	7,402	1,406	2,026	3,086	2,438	1,073	2,790	2,438	2,261
15	1,517	1,295	27,260	6,434	1,351	2,202	2,438	2,085	1,073	2,790	2,261	2,438
16	1,462	1,295	19,438	5,447	1,295	2,202	2,320	1,850	962	2,731	1,968	2,848
17	1,295	1,184	31,670	4,751	1,295	1,908	2,144	1,628	851	2,438	1,968	15,012
18	1,240	1,073	31,850	4,313	1,073	1,968	2,202	1,517	851	2,085	1,908	16,760
19	1,684	1,073	23,210	3,944	1,073	1,850	2,202	1,406	851	1,850	1,794	13,640
20	2,202	1,073	14,040	3,454	1,073	1,850	15,508	1,406	740	2,085	1,850	11,000
21	1,073	1,184	10,520	3,208	1,295	1,739	28,340	1,517	631	2,438	1,739	9,107
22	1,968	1,018	9,800	2,966	1,462	1,794	29,960	1,517	631	2,378	1,739	23,120
23	7,545	1,295	10,120	2,672	1,517	2,026	25,100	1,351	740	2,026	1,794	27,350
24	8,722	1,406	10,600	2,261	1,295	1,850	21,140	1,351	676	1,908	1,739	18,650
25	6,104	1,073	9,646	2,144	1,184	1,572	18,300	1,295	740	1,908	1,794	12,280
26	4,005	1,018	8,046	1,968	1,572	1,351	12,600	1,295	1,517	1,850	1,908	10,200
27	3,392	1,684	6,973	1,850	1,968	1,572	9,492	1,184	2,144	1,739	2,320	8,188
28	4,691	9,646	6,698	1,908	1,908	1,572	16,250	1,295	1,968	11,240	2,672	6,764
29	5,576	......	9,184	1,908	1,794	2,672	11,640	1,351	8,260	19,000	2,790	5,384
30	3,882	......	10,440	2,085	1,628	14,520	8,260	1,406	5,006	15,095	2,614	5,006
31	2,672	......	9,880	......	1,517	......	9,960	1,128	......	9,880	......	4,565
Mean	3,188	2,064	19,714	5,095	1,676	2,376	9,588	2,948	1,420	4,200	2,738	7,591

Mean Daily Discharge, Second-feet, of Susquehanna River, Binghamton, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	4,005	20,060	35,673	13,580	1,462	359	3,882	1,968	13,160	906	3,638	2,144
2	3,760	15,260	28,070	10,920	1,351	422	3,025	1,684	8,799	1,018	3,208	2,320
3	4,751	15,342	17,100	8,722	1,295	359	2,378	1,406	6,302	1,073	2,908	2,202
4	8,722	18,913	11,960	8,414	1,295	232	2,026	1,295	4,751	962	2,672	2,202
5	9,261	23,660	10,200	7,688	1,240	296	1,739	1,850	......	1,018	2,672	2,144
6	7,188	17,780	12,760	6,368	1,184	232	1,517	3,454	......	1,295	3,148	1,794
7	5,069	12,520	12,360	5,972	1,128	168	1,351	3,638	......	1,517	3,454	1,908
8	4,880	8,260	12,520	8,117	1,073	359	1,295	3,086	2,320	2,320	2,966	1,908
9	4,128	7,259	27,800	10,200	1,073	232	1,184	2,555	2,261	17,865	2,672	2,026
10	11,560	6,368	27,080	8,414	962	232	1,128	2,144	1,968	45,550	2,438	1,406
11	9,960	6,038	30,680	7,402	851	232	1,018	2,378	2,202	48,900	2,378	1,739
12	11,160	9,723	30,410	6,566	851	2,496	962	2,614	2,261	32,750	2,261	1,968
13	11,400	14,440	23,570	5,576	851	9,338	962	2,320	2,085	18,563	2,144	2,202
14	11,640	11,640	17,100	4,817	851	4,128	906	2,085	1,850	11,400	2,085	3,454
15	10,920	8,188	13,580	5,642	851	2,086	1,018	1,968	1,572	8,568	1,908	3,576
16	10,760	6,566	11,480	5,447	740	2,144	906	1,684	1,406	6,830	1,908	3,331
17	9,880	4,628	9,960	4,817	740	1,850	851	1,462	1,572	6,104	10,440	2,966
18	8,568	3,331	9,646	4,188	740	1,739	962	1,406	1,850	16,420	14,380	2,672
19	7,116	3,698	8,645	3,576	740	1,517	1,128	1,351	1,739	17,610	9,646	2,555
20	5,906	4,439	7,545	3,208	631	1,406	1,073	1,351	1,739	13,160	6,170	2,144
21	6,302	4,880	6,830	2,790	631	1,908	1,240	1,739	1,517	9,723	4,691	6,500
22	13,080	4,313	10,120	2,496	631	4,943	1,295	2,202	1,351	7,760	3,882	9,492
23	13,400	4,376	16,505	2,320	631	6,698	4,250	1,628	1,184	6,170	3,760	8,188
24	10,200	3,638	32,660	2,202	422	8,337	7,259	1,406	1,240	5,576	4,005	6,170
25	7,688	3,515	30,410	2,085	359	6,632	4,066	1,295	1,184	5,321	3,821	5,642
26	6,902	3,392	22,220	2,026	359	5,447	2,555	2,320	1,073	4,691	3,148	5,006
27	6,104	2,908	15,095	1,850	422	4,005	2,085	5,840	962	4,313	2,731	4,817
28	6,038	13,960	11,640	1,739	486	2,908	1,739	4,439	962	4,128	2,555	4,128
29	9,338	......	10,440	1,628	486	3,086	1,517	27,350	962	4,128	2,672	4,439
30	23,930	......	9,184	1,517	422	4,628	1,794	26,990	906	4,066	2,672	4,628
31	25,910	......	12,040	......	359	......	2,320	19,970	......	3,882	......	4,880
Mean	9,339	9,253	17,267	5,342	810	2,647	1,917	4,415	2,562	10,116	3,901	3,566

Estimated Monthly Discharge of Susquehanna River, Binghamton, N. Y.
[Drainage area, 2,400 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1901.					
January	....	....	....	....	....
February	....	....	....	....	....
March	....	....	....	....	....
April	....	....	....	....	....
May	....	....	....	....	....
June	....	....	....	....	....
July	....	....	....	....	....
August	6,830	359	1,452	.60	.69
September	1,517	631	996	.41	.46
October	1,628	631	1,025	.43	.50
November	4,066	550	1,459	.61	.68
December	43,015	1,462	7,491	3.12	3.60
1902.					
January	8,722	1,073	3,188	1.33	1.53
February	9,646	1,018	2,064	.86	.89
March	60,400	6,698	19,714	8.20	9.48
April	10,440	1,850	5,095	2.12	2.37
May	2,672	1,073	1,676	.70	.81
June	14,520	1,351	2,376	.99	1.10
July	29,960	2,202	9,588	3.99	4.60
August	11,240	1,128	2,948	1.23	1.42
September	8,260	631	1,420	.59	.66
October	19,000	1,739	4,200	1.75	2.02
November	7,116	1,739	2,738	1.14	1.31
December	27,350	2,261	7,591	3.16	3.53
The year	....	....	....	....	....

Estimated Monthly Discharge of Susquehanna River, Binghamton, N. Y.

[Drainage area, 2,400 square miles.]

MONTH.	DISCHARGE IN SECOND-FEET.			RUN-OFF.	
	Maximum.	Minimum.	Mean.	Second feet per square mile.	Depth in inches.
1903.					
January	25,910	3,760	9,339	3.88	4.47
February	23,660	2,908	9,259	3.85	4.00
March	35,673	6,830	17,267	7.18	8.28
April	13,580	1,517	5,342	2.22	2.48
May	1,462	359	810	.34	.39
June	9,338	168	2,647	1.10	1.23
July	7,259	851	1,917	80	.92
August	27,350	1,295	4,415	1.83	2.11
September	18,160	906	2,562	1.06	1.18
October	48,900	906	10,116	4.21	4.85
November	14,380	1,908	3,901	1.62	1.81
December	9,492	1,406	3,566	1.48	1.71
The year	....	....	....	....	....

A current-meter measurement of Susquehanna River at Sidney, above the inflow of Unadilla River was made by C. C. Covert, September 12, 1903; discharge 1162 second-feet, from a drainage area of 1,470 square miles.[a]

A measurement of Unadilla River at the first bridge above its mouth on the same date showed a discharge of 654 second-feet from a drainage area of 565 square miles.

Chenango and Susquehanna Rivers are subject to severe freshets, notably as a result of ice jams in the streams. The duration of the ice season in the lakes and rivers of this district is shown in the following table, giving the date of opening and closing of Otsego Lake by ice. A record has been furnished by G. Pomeroy Keese.

WINTER.	Date of closing.	Date of opening.
1891- 2	January 20	April 5
1892- 3	December 28	April 17
1893- 4	January 13	March 22
1894- 5	December 29	April 19
1895- 6	January 6	April 18
1896- 7	January 18	April 9
1897- 8	January 28	March 19
1898- 9	January 10	April 24
1899-1900	January 9	April 20
1900-01	January 19	April 17
1901-02	January 17	March 29

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[a] Water surface 25.8 feet below top of handrail upstream side of bridge, 25 feet from left-hand abutment.

The accompanying diagram illustrates the relative discharge rates of Chenango and Susquehanna Rivers at Binghamton in the notable floods of December 15, 1901, and March 1, 1902.

The rainfall of the drainage basins of Chenango and Susquehanna Rivers has been compiled from the records of U. S. Weather Bureau. Susquehanna River crosses into Pennsylvania at State Line and returns to New York State about 12 miles upstream from Binghamton. The rainfall stations chosen are entirely within New York State.

The relation between precipitation and run-off for five months of 1901 and for the years 1902 and 1903, is given in the following table:

YEAR.	SUSQUEHANNA.		YEAR.	CHENANGO.	
	Precipitation.	Run-off, inches.		Precipitation.	Run-off, inches.
1901	17.95	5.93	1901	17.60	5.80
1902	43.11	29.89	1902	43.30	28.84
1903	45.01	33.43	1903	42.68	31.29
Total	106.07	69.25	Total	103.58	65.93
Per cent	....	65.29	Per cent	....	63.65

CHEMUNG RIVER AT CHEMUNG, CHEMUNG COUNTY, N. Y.

A gauging station was established at the suspension bridge across Chemung River near Chemung station, September 7, 1903. Observations of the stream stage are taken each morning and night by Daniel L. Orcutt from a weight and chain gauge attached to the bridge. Current-meter measurements which have been made, and the mean daily stage of the stream, are shown in the accompanying tables. The gauging station is located one mile upstream from the New York-Pennsylvania Line, and is shown on the Waverly quadrangle No. 67 of the U. S. Geological Survey Topographic map.

Chemung River is formed at Painted Post, N. Y., by the union of Tioga and Cohocton Rivers. The Cohocton Branch lies entirely in the State of New York. Tioga River receives, just above its mouth, the Canisteo River, a large tributary, which also has its drainage basin in New York to the south of Cohocton. The drainage of Tioga River above Canisteo is mainly in Pennsylvania. The concentration of the storm waters through three main branches just above Corning favors the formation of excessive floods.

Chemung River flows southeasterly through Corning, Elmira and Chemung, crosses the State Line, flows for a short distance in Pennsylvania, then returns to New York and again crosses to Pennsylvania near Waverly, finally emptying into Susquehanna River near Athens, Bradford County, Pa. The total length of the stream in New York State is about 30 miles. Chemung River is a sluggish stream with low banks and a broad valley or flood plain which is often overflowed. It was formerly paralleled by a canal taking its supply from dams across the stream. This has been abandoned and at present the largest water power development on the main river is at Elmira.

The topographic features of the drainage basin are, as a rule, bold and broad. The hills rise within a short distance of the stream several hundred feet on either side, and the upland plateau is to a large extent wooded, with impervious soil, no lake storage, and few marsh areas. Tributaries are ramifying and uniformly distributed, though not very numerous, and dry gulleys or flood channels are common. Dykes have been erected in the Cities of Elmira and Corning for protection against floods. One of the highest recorded freshets in the stream occurred June 1, 1889. It was preceded by phenomenal rainfall, aggregating several inches in the course of a few hours, on the night of May 31 and June 1. The discharge has been estimated at 67 second-feet per square mile from 2,055 square miles or 138,000 cubic feet per second.[a]

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[a] Report of Francis Collingwood, C. E., on The Protection of the City of Elmira, N. Y., Against Floods.

Drainage Areas, Chemung River. *a*

-	Square miles.
Cohocton River above Bath, N. Y	336.4
Cohocton River, Bath to mouth	293.4
Cohocton River, total	630.00
Canisteo River, including Bennett Creek	269
Canisteo River, Bennett Creek to mouth of Tioga River	271
Canisteo River, total	540
Chemung River to Elmira	2,107
Chemung River to mouth	2,518
Tioga River at mouth	1,334

Mean Daily Gauge Height, Feet, of Chemung River, at Chemung, N. Y.

DAY.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	......	......	......	......	2.24	2.98	2.90
2	......	......	......	......	......	......	......	......	......	2.40	2.88	2.88
3	......	......	......	......	......	......	......	......	......	2.52	3.88	2.88
4	......	......	......	......	......	......	......	......	......	2.57	2.83	2.88
5	......	......	......	......	......	......	......	......	......	2.74	2.86	2.82
6	......	......	......	......	......	......	......	......	......	3.30	2.90	2.59
7	......	......	......	......	......	......	......	......	3.29	3.37	3.08	3.69
8	......	......	......	......	......	......	......	......	2.24	4.62	2.98	2.79
9	......	......	......	......	......	......	......	......	3.19	9.97	4.93	2.69
10	......	......	......	......	......	......	......	......	3.16	7.78	2.90	2.64
11	......	......	......	......	......	......	......	......	4.84	8.80	2.88	2.49
12	......	......	......	......	......	......	......	......	4.56	6.74	2.86	2.49
13	......	......	......	......	......	......	......	......	3.84	6.12	2.80	2.69
14	......	......	......	......	......	......	......	......	3.46	4.97	2.73	2.69
15	......	......	......	......	......	......	......	......	3.22	4.47	2.68	2.69
16	......	......	......	......	......	......	......	......	3.06	4.20	2.76	2.74
17	......	......	......	......	......	......	......	......	2.96	3.92	7.06	2.74
18	......	......	......	......	......	......	......	......	3.44	7.04	8.13	2.64
19	......	......	......	......	......	......	......	......	3.46	6.24	5.88	2.64
20	......	......	......	......	......	......	......	......	3.29	4.90	4.88	2.64
21	......	......	......	......	......	......	......	......	2.99	4.42	4.26	2.69
22	......	......	......	......	......	......	......	......	2.84	4.12	3.98	2.74
23	......	......	......	......	......	......	......	......	2.54	3.87	3.88	2.79
24	......	......	......	......	......	......	......	......	2.34	4.72	3.83	2.79
25	......	......	......	......	......	......	......	......	2.34	3.54	3.78	2.79
26	......	......	......	......	......	......	......	......	2.29	3.44	3.38	2.74
27	......	......	......	......	......	......	......	......	2.24	3.32	3.23	2.69
28	......	......	......	......	......	......	......	......	2.24	3.30	3.10	2.54
29	......	......	......	......	......	......	......	......	2.22	3.24	3.10	2.44
30	......	......	......	......	......	......	......	......	2.26	3.22	3.10	2.54
31	......	......	......	......	......	......	......	......	......	3.13	......	2.64

Current-meter Discharge Measurements of Chemung River at Chemung, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.
1903.			
August 27	C. C. Covert	2.89	809
September 7	R. E. Horton	3.29	1,354
October 2	H. H. Halsey	2.47	611
October 12	C. C. Covert	6.72	3,766

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a Approximate New York areas, from Bien's Atlas. Pennsylvania areas somewhat uncertain.

CAYUTA CREEK AT WAVERLY, TIOGA COUNTY, N. Y.

A record of the daily stage of Cayuta Creek at the Ithaca Street Bridge, a short distance below the mill dam in Waverly, was kept by T. P. Yates, C. E., covering the period March 1, 1898, to March 31, 1902. The accompanying tables show the observed distance from the reference point on bridge to water surface; the mean of the several readings being used where more than one daily observation was taken.[a] Discharge measurements by means of floats were also made by Mr. Yates.

Cayuta Creek drains a long narrow valley extending from Eastern Schuyler County in a direction somewhat east of southerly, a distance of thirty miles; the stream crossing the New York State Line at Waverly and debouching into Susquehanna River at Sayre, Penn. In cross-section, the valley consists of a plain about one-half mile wide through which the stream flows, bordered on both sides by abrupt slopes rising 500 feet within a distance of one or two miles from the foot on each side, beyond which lies a plateau dissected by the numerous short latteral tributaries and their branches.

Cayuta Lake drains an area of 16.5 square miles at the head of the stream. The area of the lake is 0.78 square mile, and this constitutes the only storage in the drainage basin. The average width of the valley is about six miles. The conditions favor rapid concentration of the run-off in the main stream, there being no large branches. Maximum floods result, however, only from rapid inflow of sufficient duration to enable the waters from the whole length of the valley to reach the lower stretches of the stream at the same time. Cayuta Lake is at elevation 1,272. The stream descends to elevation 800 feet at Waverly, in a distance of 18 miles from Cayuta Lake following the general trend of the valley; a limited amount of water power being developed at small dams.

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[a] Reference point is top iron handrail at lefthand side, second iron post from lefthand end of bridge on upstream side.

DRAINAGE AREAS OF CAYUTA CREEK.[a]

LOCATION.	Area sq. miles.	Total.
Above Outlet, Cayuta Lake	16.5	16.5
Above Van Etten	91.5	108
Above Ithaca Street Bridge, Waverly	41.3	149.2

Current-meter Discharge Measurements of Cayuta Creek, at Waverly, N. Y. (Bridge at Ithaca Street).

DATE.	Hydrographer.	Gauge height, feet.[b]	Discharge, second-feet.
1903.			
June 13	R. E. Horton	17.11	24.9
August 27	C. C. Covert	17.25	46.3
October 2	H. H. Halsey	17.00	25.4
October 12	H. H. Halsey	14.45	698

Observed Daily Distance, Feet, of Water Surface Below Reference Point in Cayuta Creek, at Waverly, N. Y.

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1898.												
1	......	......	16.9	16.0	16.3	16.8	17.5	17.7	17.2	17.8	16.7	16.7
2	......	......	......	16.2	16 4	......	17.6	......	17.3	......	16.8	16.8
3	......	......	16.8	16.4	......	16.9	......	17.8	17.4	......	16.9	......
4	......	......	......	16.5	16.3	......	......	17.3	17.5	......	......	......
5	......	......	16.9	16.6	16.5	17.0	......	17.05	......	......	17.0	16.7
6	......	......	......	......	15.6	17.1	......	17.1	17.6	......	......	......
7	......	......	16.8	16.7	16.2	17.3	......	17.4	16.87	......	17.1	......
8	......	......	16.5	16.8	16.4	17.0	......	17.7	16.70	17.3	......	16.8
9	......	......	......	16.9	16.5	17.1	......	......	17.0	17.4	17.2	16.9
10	......	......	16.3	......	16.6	17.2	......	......	17.3	17.6	14.87	17.0
11	......	......	14.6	......	16.7	16.63	......	......	17.4	17.7	13.30	17.1
12	......	......	13.0	......	16.6	16.9	......	......	......	17.8	15.25	......
13	......	......	15.0	......	16.4	17.0	......	17.6	17.5	17.7	15.7	17.2
14	......	......	15.3	17.0	16.6	17.0	17.7	17.5	17.5	16.54	16.0	......
15	......	......	15.5	......	16.7	17.1	......	17.6	17.6	16.3	16.3	......
16	......	......	15.8	......	16.23	17.2	......	......	......	16.85	16.6	......
17	......	......	16.0	17.1	16.2	17.2	......	17.5	......	17.0	16.7	......
18	......	......	16.2	17.2	16.4	17.4	......	......	......	17.1	16.7	......
19	......	......	16.3	......	15.37	......	......	17.25	17.7	17.0	16.4	......
20	......	......	16.0	17.3	14.50	17.3	......	17.40	......	16.63	15.73	17.0
21	......	......	16.4	......	15.20	......	......	17.50	......	16.6	16.1	16.35
22	......	......	15.4	......	15.70	17.4	17.5	......	......	14.52	16.3	16.15
23	......	......	14.3	17.3	16.2	......	17.6	17.60	......	15.05	16.4	13.8
24	......	......	15.0	12.05	15.33	......	17.7	17.70	......	16.0	16.5	14.7
25	......	......	15.4	12.25	......	17.5	17.8	17.35	......	16.3	16.6	15.8
26	......	......	15.8	13.40	15.95	......	17.5	17.30	17.8	16.38	......	16.0
27	......	......	16.0	14.90	16.0	17.4	17.6	......	......	15.2	16.7	16.5
28	......	......	16.1	15.50	16.3	......	17.7	17.5	......	16.1	16.6	16.6
29	......	......	15.4	15.80	16.5	......	17.6	17.6	......	16.4	......	16.7
30	......	......	......	16.0	16.6	......	17.7	16.57	......	16.6	16.7	16.8
31	......	......	15.8	......	16.7	......	......	17.00	......	......	......	15.9

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[a] From Watkins, Ithaca and Waverly quadrangles, Nos. 60, 66 and 67, U. S. G. S. Topographic map.

[b] Gauge inverted.

Observed Daily Distance, Feet, of Water Surface Below Reference Point in Cayuta Creek, at Waverly, N. Y.—(Continued.)

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1899.												
1	15.8	17.8	15.5	15.8	17.0	17.3	17.8	17.9	17.9	17.9	15.08	17.7
2	16.2	......	16.0	15.9	17.1	16.45	......	......	......	......	15.40	......
3	16.3	17.6	16.2	16.0	......	17.0	......	......	......	......	15.90	......
4	......	......	14.4	16.3	......	17.2	......	......	......	......	......	......
5	14.03	17.2	13.2	16.5	......	17.3	......	......	......	......	16.50	17.8
6	15.55	......	14.0	16.6	......	17.4	......	18.0	......	18.0	16.60	......
7	15.8	......	14.6	16.7	17.3	......	......	......	......	......	16.70	......
8	16.0	......	16.0	14.6	......	17.3	17.9	......	......	......	16.80	......
9	16.1	......	16.3	15.0	......	17.4	15.6	......	......	......	16.90	......
10	16.4	......	......	15.8	......	17.5	17.2	18.1	18.0	......	17.0	......
11	......	......	16.4	16.2	......	......	17.3	......	......	......	17.1	......
12	16.5	17.1	15.2	15.35	17.2	17.6	......	......	......	......	16.5	16.02½
13	16.7	......	14.46	14.4	17.3	......	......	18.0	......	......	16.9	16.4
14	......	......	15.7	14.9	17.4	......	......	......	......	......	......	......
15	14.9	17.2	16.0	15.4	......	......	17.8	......	......	......	......	66.5
16	15.6	......	16.0	......	......	17.7	17.5	18.0	......	18.1	17.0	......
17	15.8	17.3	16.3	15.9	17.3	......	17.3	......	......	......	......	16.7
18	15.9	......	16.6	16.3	17.26	17.8	16.8	......	......	......	......	16.7
19	......	......	15.9	16.4	17.2	......	......	......	......	......	......	......
20	16.0	17.2	16.1	......	......	......	17.4	......	......	......	......	......
21	16.3	16.7	16.6	......	......	......	......	......	......	......	17.2	16.8
22	16.5	16.0	16.3	......	17.3	......	......	......	......	......	......	......
23	16.8	14.8	15.4	16.6	......	......	17.6	......	......	......	......	......
24	17.2	15.4	15.9	16.6	......	......	......	......	......	......	......	16.9
25	17.4	......	16.2	16.7	......	17.55	......	......	......	......	17.4	15.0
26	17.6	16.3	16.5	16.6	17.4	......	......	18.1	......	......	......	15.7
27	17.7	15.6	16.0	16.7	......	......	......	......	17.9	......	......	15.9
28	17.8	......	15.7	16.8	......	17.7	......	17.77	......	......	......	16.0
29	......	......	15.5	......	17.5	......	......	......	......	......	17.6	16.3
30	......	......	15.9	16.8	17.2	17-8	17.9	17.9	......	......	17.7	16.6
31	......	......	15.8	......	17.2	......	......	......	......	......	......	16.9
1900.												
1	16.9	16.9	14.08	16.1	14.3	17.3	17.9	18.1	18.2	18.3	18.3	15.0
2	......	......	14.0	15.2	......	......	......	......	......	......	......	15.5
3	......	17.0	15.40	14.3	16.4	17.1	......	......	......	......	......	15.7
4	......	17.1	15.80	14.7	......	17.2	......	......	......	......	......	15.5
5	......	16.5	16.10	15.6	16.5	......	......	......	......	......	......	14.06
6	......	......	16.40	15.05	......	17.3	17.6	......	......	......	......	14.6
7	......	16.8	16.70	13.76	15.6	17.5	17.5	......	......	......	......	15.0
8	......	......	16.60	13.8	......	17.5	17.7	......	......	......	......	15.2
9	17.0	16.5	16.40	15.5	16.7	17.4	......	......	......	......	......	15.6
10	......	14.0	15.40	16.0	......	17.5	......	......	......	......	......	15.8
11	......	15.4	15.90	......	......	......	17.8	......	......	......	......	16.0
12	......	16.4	16.00	16.1	......	......	......	......	......	......	......	16.2
13	......	15.5	16.2	......	16.8	......	......	......	......	......	......	16.3
14	......	15.6	16.4	......	......	17.6	......	......	......	......	......	16.4
15	......	16.0	16.7	......	......	......	......	......	......	......	18.2	16.5
16	......	16.4	16.9	15.9	......	......	......	......	......	......	......	......
17	......	16.6	......	15.15	16.9	17.7	......	......	......	......	......	16.6
18	......	16.8	......	14.45	......	......	17.9	......	......	......	......	......
19	17.0	17.0	16.6	14.9	......	17.8	......	......	......	......	......	16.7
20	13.50	......	13.7	15.5	......	17.6	......	......	......	......	......	......
21	12.55	17.2	15.4	16.2	12.0	......	......	......	......	......	......	16.8
22	15.1	12.13	16.4	16.0	......	......	......	......	......	......	......	......
23	15.7	12.20	15.2	15.5	......	......	18.0	......	......	......	18.1	16.8
24	16.1	15.40	15.05	16.0	......	17.7	......	......	......	......	......	15.35
25	16.7	15.00	......	......	17.1	......	......	......	......	18.2	18.0	15.6
26	14.70	15.80	......	16.1	......	17.8	......	......	......	18.25	10.8	15.9
27	15.90	16.20	16.20	......	......	......	18.1	......	......	18.3	11.75	16.2
28	16.40	16.70	16.1	16.2	17.2	......	......	......	......	......	14.4	16.4
29	16.80	......	16.2	......	......	......	......	......	......	......	14.5	16.5
30	......	......	......	16.3	......	17.9	......	......	......	......	14.7	......
31	16.90	......	16.3	......	17.3	......	......	......	......	......	......	......

Observed Daily Distance, Feet, of Water Surface Below Reference Point, in Cayuta Creek, at Waverly, N. Y.—(Concluded).

DAY.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1901.												
1	16.5	17.3	17.5	15.7	16.1	14.8	17.3	17.6	17.1	17.4	17.8	17.3
2	16.7	......	......	15.95	16.2	15.06	......	17.6	16.9	17.5	......	......
3	16.8	17.4	......	15.45	15.85	15.2	......	......	17.1	17.4	......	16.8
4	16.9	......	17.45	15.1	16.2	15.5	17.4	......	17.2	......	......	......
5	......	......	17.4	15.2	16.3	15.9	17.4	17.7	17.3	......	......	......
6	......	......	17.5	14.05	16.5	16.1	17.0	17.8	17.4	17.5	......	16.9
7	17.0	......	......	12.35	16.6	15.86	17.1	17.7	17.5	17.6	......	......
8	......	......	......	12.9	16.7	15.3	17.3	17.4	17.6	......	......	17.0
9	......	......	17.3	13.9	......	16.0	......	......	17.7	......	......	17.05
10	16.95	17.5	16.9	14.1	......	16.3	......	17.6	......	......	......	14.86
11	16.4	......	13.25	14.7	16.6	16.5	......	......	......	......	......	15.0
12	15.63	......	14.0	14.9	16.5	16.8	17.5	17.7	......	......	......	16.2
13	16.1	......	15.2	15.0	16.4	......	......	......	......	......	......	16.3
14	16.5	......	15.65	15.3	16.5	......	......	......	17.5	17.5	17.7	13.48
15	16.5	......	15.15	15.6	16.7	......	......	17.7	17.4	......	......	9.80
16	16.0	......	15.35	15.8	16.8	......	......	17.0	......	......	......	13.35
17	16.1	17.5	15.6	15.9	16.9	17.0	......	17.3	17.3	......	......	14.4
18	16.5	......	15.36	16.0	16.9	......	......	......	......	......	......	15.0
19	......	......	14.2	16.1	16.7	......	17.4	17.4	17.4	......	......	15.4
20	16.6	......	15.4	14.75	16.9	16.9	17.5	17.4	......	......	17.8	15.6
21	16.7	......	12.52	11.75	......	......	......	17.0	......	......	......	15.7
22	16.8	......	14.26	11.83	16.85	17.0	......	17.3	17.5	......	......	15.8
23	16.9	......	15.1	13.4	16.8	......	......	17.4	......	17.6	......	16.0
24	17.1	17.5	14.2	13.75	16.5	......	17.6	......	......	......	15.16	16.2
25	......	......	13.3	14.1	16.4	17.1	17.7	......	17.6	......	14.7	......
26	......	......	12.26	14.6	16.5	17.2	......	......	......	......	15.0	16.3
27	......	......	11.73	15.1	16.5	......	17.5	......	......	17.7	16.2	......
28	......	......	13.5	15.5	15.58	17.3	......	......	17.7	......	16.6	......
29	......	......	14.8	15.8	13.3	......	17.6	......	17.4	......	17.1	16.4
30	17.2	......	15.2	16.0	13.85	......	17.4	17.5	......	17.8	17.2	16.0
31	......	......	15.5	......	14.6	......	......	17.5	......	......	......	16.1
1902.												
1	16.2	15.6	9.5	......	......	......	......	......	......	......	......	......
2	16.4	.....	11.2	......	......	......	......	......	......	......	......	......
3	16.3	......	11.5	......	......	......	......	......	......	......	......	......
4	16.4	......	13.5	......	......	......	......	......	......	......	......	......
5	......	......	14.8	......	......	......	......	......	......	......	......	......
6	......	......	15.4	......	......	......	......	......	......	......	......	......
7	16.5	16.0	15.0	......	......	......	......	......	......	......	......	......
8	......	......	15.0	......	......	......	......	......	......	......	......	......
9	......	......	14.8	......	......	......	......	......	......	......	......	......
10	16.7	......	14.3	......	......	......	......	......	......	......	......	......
11	......	......	14.0	......	......	......	......	......	......	......	......	......
12	16.9	......	13.9	......	......	......	......	......	......	......	......	......
13	......	......	12.7	......	......	......	......	......	......	......	......	......
14	17.0	......	13.5	......	......	......	......	......	......	......	......	......
15	......	16.4	14.3	......	......	......	......	......	......	......	......	......
16	17.1	......	14.2	......	......	......	......	......	......	......	......	......
17	17.2	......	11.5	......	......	......	......	......	......	......	......	......
18	17.3	......	14.0	......	......	......	......	......	......	......	......	......
19	17.4	......	14.8	......	......	......	......	......	......	......	......	......
20	17.5	16.5	15.0	......	......	......	......	......	......	......	......	......
21	......	......	15.2	......	......	......	......	......	......	......	......	......
22	15.5	......	15.4	......	......	......	......	......	......	......	......	......
23	13.15	......	15.4	......	......	......	......	......	......	......	......	......
24	14.0	......	15.6	......	......	......	......	......	......	......	......	......
25	15.0	16.8	15.8	......	......	......	......	......	......	......	......	......
26	15.4	......	16.0	......	......	......	......	......	......	......	......	......
27	15.4	16.65	16.2	......	......	......	......	......	......	......	......	......
28	15.0	12.4	16.4	......	......	......	......	......	......	......	......	......
29	15.4	......	16.4	......	......	......	......	......	......	......	......	......
30	15.8	......	......	......	......	......	......	......	......	......	......	......
31	......	......	16.4	......	......	......	......	......	......	......	......	......

ALLEGHENY RIVER DRAINAGE.

ALLEGHENY RIVER AT RED HOUSE, CATTARAUGUS COUNTY, N. Y.

The gauging station was established at the highway bridge, Redhouse Village, September 4, 1903. A weight and chain gauge is attached to the bridge by means of which the stream stage is observed each morning and night by G. H. Smith.

The Allegheny River joins with Monongahela River at Pittsburg to form the Ohio. Allegheny River rises in Potter County, Pa., its sources lying adjacent to those of Susquehanna and Genesee Rivers. Its course is west and northerly, the stream entering New York State near the southeast corner of Cattaraugus County and, making a bold bend across the county, it again enters Pennsylvania at a point near the southwest corner of Cattaraugus County.

The gauging station is located about thirteen miles above the point where the river leaves New York State.

The drainage basin is rugged, largely timber-covered, and rises abruptly several feet above the stream on either side closely adjacent to the river. A portion of the drainage in New York is shown on the Salamanca and Olean quadrangles Nos. 20 and 26 of the U. S. Geological Survey Topographic map. The stream valley itself is broad and flat, varying from one to two miles in width, and the current, as a rule, is sluggish. The plateaus from which the stream receives its drainage are deeply dissected by tributaries and are very irregular in contour. The soil is, as a rule, impervious and dry gulleys are numerous.

At Olean the wasteway from Cuba Reservoir enters the stream through Olean Creek. This reservoir is located on the divide between Oil Creek, tributary to Allegheny River and Genesee River. The storage is commonly turned into Genesee River through the abandoned summit level of Genesee Valley Canal, but may be diverted into Oil Creek through the guard lock at the head of the canal.

Conewango Creek, which is the outlet of Chautauqua Lake, is the principal tributary to Allegheny River from New York. This stream does not join Allegheny River in this State, however.[a]

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[a] Allegheny River is described in Vol. XVII, 10th U. S. Census, Water Power, Part 2, pp. 440-453.

Current-meter Discharge Measurements of Allegheny River at Redhouse, N. Y.

DATE.	Hydrographer.	Gauge height, feet.	Discharge, second-feet.	Remarks.
1903.				
September 4	R. E. Horton	4.33	1,909	
August 29	C. C. Covert	....	a6,844	Union St. Br., Olean, N. Y.
September 3	C. C. Covert	....	1,312	Highway Br. nr. Portville, N.Y.

Mean Daily Gauge Height, Feet, of Allegheny River at Redhouse, N. Y.

DAY	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	......	......	......	......	......	......	......	......	......	3.35	3.70	4.05
2	......	......	......	......	......	......	......	......	......	3.70	3.70	4.00
3	......	......	......	......	......	......	......	......	......	3.85	3.60	3.85
4	......	......	......	......	......	......	......	......	4.35	3.70	3.60	3.75
5	......	......	......	......	......	......	......	......	4.15	4.28	3.60	3.65
6	......	......	......	......	......	......	......	......	4.00	4.60	3.70	3.60
7	......	......	......	......	......	......	......	......	3.88	4.32	3.90	3.60
8	......	......	......	......	......	......	......	......	3.82	5.00	3.70	3.60
9	......	......	......	......	......	......	......	......	3.78	7.05	3.65	3.60
10	......	......	......	......	......	......	......	......	3.70	6.35	3.60	3.60
11	......	......	......	......	......	......	......	......	4.40	5.75	3.60	3.55
12	......	......	......	......	......	......	......	......	5.00	5.20	3.65	3.50
13	......	......	......	......	......	......	......	......	4.25	4.82	3.70	3.50
14	......	......	......	......	......	......	......	......	4.15	4.55	3.70	3.50
15	......	......	......	......	......	......	......	......	3.85	4.35	3.60	3.50
16	......	......	......	......	......	......	......	......	3.75	4.25	3.60	4.10
17	......	......	......	......	......	......	......	......	3.70	4.15	7.30	4.20
18	......	......	......	......	......	......	......	......	5.00	4.15	7.95	4.20
19	......	......	......	......	......	......	......	......	4.60	4.70	7.30	4.20
20	......	......	......	......	......	......	......	......	4.22	4.50	6.45	4.22
21	......	......	......	......	......	......	......	......	4.05	4.30	6.25	4.25
22	......	......	......	......	......	......	......	......	3.90	4.22	5.80	4.25
23	......	......	......	......	......	......	......	......	3.75	4.20	5.32	4.25
24	......	......	......	......	......	......	......	......	3.70	4.10	5.18	4.22
25	......	......	......	......	......	......	......	......	3.58	4.00	5.00	4.25
26	......	......	......	......	......	......	......	......	3.50	3.85	4.65	*b*
27	......	......	......	......	......	......	......	......	3.50	3.85	4.45	......
28	......	......	......	......	......	......	......	......	3.40	3.65	4.35	......
29	......	......	......	......	......	......	......	......	3.42	3.80	4.25	......
30	......	......	......	......	......	......	......	......	3.35	3.80	4.20	......
31	......	......	......	......	......	......	......	......	......	3.70	......	......

CHAUTAUQUA LAKE, CHAUTAUQUA COUNTY, N. Y.

Chautauqua Lake extends in a northwest and southeasterly direction, having its head at a distance of eight miles from Lake Erie, its water surface being at elevation 1,308 feet above tide or 735 feet above Lake Erie. Its outlet at the southeast end, near the city of Jamestown, is known as the Chadakoin River, and furnishes water power at numerous dams, entering Allegheny River in Pennsylvania, through Conewango Creek. The drainage area above the foot of the lake is 190.6 square miles, of which 20.8 square miles comprise the lake surface, which represents 10.41 per cent of the drainage area.[c] The land area tributary to the lake is very rolling and the soil impervious.

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[a] High water measurement. [b] Stream frozen over. [c] The drainage basin is mostly shown on the Chautauqua, Westfield and Dunkirk quadrangles, Nos. 4, 1 and 3, U. S. G. S. Topographic map.

The following measurements of the outflow from the lake in the unusually dry summer season of 1895 were made by E. C. Burns. The measurements of July, 1895, were made by means of floats; the later measurements were all by current meter. Some fall exists in the outlet from the foot of the lake to the first dam, the lake outflow being probably unregulated. The results of the various stream measurements have been furnished by F. W. Dalrymple, C. E.

Measurements of Discharge, Chautauqua Lake Outlet, Jamestown, N. Y.

DATE.		Second-feet.	Second-feet per square mile.
1895.			
July	18	83.9	.44
July	20	135.3	.71
July	21	42.7	.22
July	22	68.8	.36
July	23	71.9	.38
July	28	53.6	.28
July	30	98.8	.52
July	31	105.3	.55
Aug.	16	106.1	.56
Aug.	17	78.2	.41
Aug.	18	87.9	.46
Aug.	19	93.0	.48
Aug.	20	88.5	.46
Aug.	21	82.8	.43
Aug.	26	92.3	.48
Aug.	27	96.0	.50
Aug.	28	78.5	.41
Aug.	29	62.4	.32
Aug.	30	88.2	.46
Aug.	31	113.1	.59
Sept.	2	46.3	.24
Sept.	3	80.4	.42
Sept.	4	64.2	.34
Sept.	5	40.7	.21
Sept.	6	43.8	.22
Sept.	10	43.8	.22
Sept.	13	62.0	.32
Sept.	18	71.6	.38
Sept.	20	41.8	.22
Sept.	24	68.3	.36
Sept.	26	86.6	.45
Oct.	9	47.8	.25
Oct.	10	43.0	.22
Oct.	11	48.0	.25
Oct.	12	41.9	.22
Oct.	13	34.6	.18
Oct.	14	47.7	.25
Oct.	15	43.7	.22
Oct.	16	*a* 66.0	.34
Oct.	17	*b* 36.0	.18

The following additional measurements have been made:

DATE.	C. F. S.	Second-feet per square mile.
April 30, 1902	466	2.446
September 6, 1903 *c*	130.6	.686

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a Strong wind down the lake. *b* Wind up the lake. *c* By R. E. Horton. Steele Street Bridge. Water surface 12.54 feet below down-stream corner right-hand abutment coping on downstream side of bridge.

REPORT OF FIELD SEASON, 1903.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY.
WASHINGTON, D. C., *December* 5, 1903.

HON. EDWARD A. BOND, *State Engineer and Surveyor, Albany, N. Y.:*

Sir.—I have the honor to make the following preliminary statement of the results of the cooperative topographic survey made during the field season of 1903, under the terms of our correspondence signed by you May 15, 1903, and by me May 19, 1903. In this it was agreed that the topographic survey of the State of New York should be continued as provided by the agreement signed by us March 27, 1899.

Under enactment by the Legislature of New York, in chapter 599 of the Laws of 1903, an appropriation of $20,000 was made for the continuation of the cooperative topographic survey of the State of New York in terms similar to those of chapter 96 of the Laws of 1899. Of this sum $19,000 was set aside for the above purpose by the State and a like amount by this bureau. In addition, an unexpended balance of State funds amounting to $2,557 remained from the appropriation of the last fiscal year, a total of $21,557 of State funds being thus available. In addition the federal bureau had a balance of 1902 funds amounting to $3,458, making a total of United States funds available to the amount of $22,458. There was, therefore, a total of $44,015 available for cooperative topographic surveys within the State of New York for the fiscal year 1903-4.

From the expenditures made under the above agreement an accurate trigonometric survey was completed of an area of 225 square miles. This triangulation furnishes control for the future topographic mapping of one sheet. There also resulted 241 miles of primary traverse for the control of four additional sheets covering an area of 880 square miles. In addition to existing unmapped data of like character, this triangulation furnishes control for the future mapping of 11,118 square miles, which will be represented on 43 atlas sheets.

In addition to the above primary control there has resulted a complete and accurate map on a scale of 1:62,500, and with a contour interval of 20 feet of 2,747 square miles, all within the borders of the State. The results of these surveys will be published on 16 separate atlas sheets, and on parts of 3 others, covering portions of 18 different counties. Finally, 8 other atlas sheets, covering 1,752 square miles, in portions of 16 different counties, were partially surveyed.

The total cost of the above work, including topographic surveys, primary triangulation and primary traverse, and including estimated expenses for the platting and drafting of the maps in the office during the coming winter, is $44,000. The total allotment to this work was $44,015, and there will therefore remain no balance at the beginning of the next field season, in the spring of 1904. The average cost of the topographic surveying, including expenditures on all accounts, within the area of the State since the commencement of this work has been to date $12.60 per square mile.

Very respectfully,
CHARLES D. WALCOTT,
Director.

COOPERATIVE TOPOGRAPHIC SURVEY OF THE STATE OF NEW YORK.

Chapter No. 599 of the Laws of 1903 contains an item making appropriation for the continuation of the topographic survey of the State of New York in cooperation with the United States Geological Survey in the same manner as is defined by chapter No. 219 of the Laws of 1898. The agreement signed by the Director of the United States Geological Survey and myself in 1899 was extended and continued in force as the agreement to govern the expenditures for the year 1903.

The terms of the above were to the effect that the State of New York allotted $19,000, and this was to be met by a like sum allotted by the United States Geological Survey. In addition an unexpended balance of State funds amounting to $2,557 remained from the appropriation of the last fiscal year, making a total of State funds available for cooperation during the year of 1903 of $21,557. In addition the federal bureau had a balance of $3,458 of 1902 funds, making a total of United States funds available for this work for the government fiscal year 1903-4 of $22,458. There was, therefore, a total of $44,015 available for cooperative topographic surveys within the State of New York.

RÉSUMÉ OF RESULTS.

During the past season primary triangulation was extended over an area of 225 square miles and four stations were occupied. The positions of these have been suitably monumented and accurately determined. The above work extended over the county of Allegany. There were run 241 linear miles of primary traverse, in the course of which 26 azimuths were observed and four additional sheets, covering 880 square miles were controlled. This work was in portions of the counties of Oswego, Oneida and Erie.

Descriptions and final computations of primary triangulation stations located during the previous field season of 1902 are appended hereto. Those determined during the present field season of 1903 will be published in my next annual report, as their positions will be computed in office this winter.

There were run during the season a total of 2,491 miles of spirit levels, along the route of which elevations of 6,905 points were determined, of which 68 are permanently marked by metal tablets. Appended hereto is published a list of such bench marks as resulted from the leveling of previous years, but which were not published in prior reports because they had not been finally adjusted to mean sea level. Also in the same place are republished descriptions and elevations of such bench marks as have appeared in previous annual reports, but which, through later reductions, have had their elevations changed.

Topographic mapping was completed on 16 separate atlas sheets, covering portions of 15 counties. There were mapped 11 other atlas sheets, covering portions of 16 counties. A total of 2,747 square miles of the area of the State was finally mapped during the season. The following tabular statement gives the results of the work for this season.

At the time of making my last report all of the essential precise leveling requisite to the completion of the topographic survey of the State had been done. In the future that expense will be saved, and the money which has been expended in connection with it in the past will be available towards the completion of topographic mapping. As a result of the past season's work control by primary triangulation or traverse has nearly been extended over the entire State. Two or three years' work for topographic surveying is already controlled in advance, and the amount of similar work in future seasons will be greatly diminished.

The above conditions are fortunate in view of the fact that a large part of the remaining unsurveyed area of the State is in the Adirondacks, where the work is exceedingly expensive and slow, and progress will in the future be proportionately retarded. The past season's work in the Adirondack's was especially unsatisfactory because of the interference with the work of the topographers during the earlier months of the year by forest

fires, including smoke and downed timber, and in the latter part of the year by excessive rains. The effect of this was to materially reduce the output of completed mapping for the whole of the State.

An important feature of the past season was the completion of the survey of Long Island. At the request of the officials of the city of New York, as well as at the instance of the hydrographic branch of the United States Geological Survey, work was pushed the past season in order that there might be executed an exhaustive examination of all the natural resources of that area. This was deemed essential in order that Long Island might be made to furnish a maximum of potable water for the use of Brooklyn and its suburban cities. On the base furnished by the topographic map and during the time of its execution in the field, there has been in progress an exhaustive study of the geology of the island, a study of its surface water resources, as well as of its underground water supplies, an examination of its woodlands, cleared lands, etc. This work has been done chiefly by federal bureaus, and in part by city officials, and the results will be of inestimable value to that portion of the State. It is planned to push the engraving of the topographic maps covering the island and immediately to follow this with a series of maps printed on a reduced scale, in order that the whole island may be assembled in one convenient sized wall map.

The United States Geological Survey has recently adopted two changes in its method of publication, which will add materially to the value, extent and usefulness of these surveys. In order to permit of the representation of a larger area within the limits of a single map sheet, that bureau is now publishing a series of atlas sheets, reduced from the original one-mile maps to the scale of two miles to one inch. These sheets are of uniform dimensions with one-mile sheets, so that within the limits of each of the former there is represented the topography of four times the area shown on the latter, or of nearly a thousand square miles. This series of maps will fill many wants which are not so well met by the larger scale one-mile series.

As heretofore stated, all wooded areas of the State have been mapped during the progress of the survey. So far the results have been retained in manuscript only in the office of the United States Geological Survey. That bureau has now commenced the publication of a series of topographic maps on which the wooded areas are indicated in faint green. These maps will be of special value to those who are interested in forest preservation, in studying the relation of cultivated to wooded areas, and they will add materially for some purposes to the value of the maps in connection with all military and engineering studies. It is to be noted that these various forms of publication are engraved and printed at the sole expense of the federal government.

CONCLUSIONS AND RECOMMENDATIONS.

To the present time there have been surveyed and mapped 178 atlas sheets, representing the topography of 33,853 square miles, or over 68 per cent of the entire area of the State. There have been engraved and published 149 separate atlas sheets, representing the topography of 26,889 square miles. The average cost of mapping this area to date has been approximately $12.60 per square mile. The State has expended $185,875 out of a total outlay of $427,136. With the expenditure of $5.50 per square mile the outlay to the State ceases. The federal bureau, however, bears the expense of engraving the maps, of printing them, and of the geologic and hydrographic surveys which may be prosecuted after the publication of the topographic map.

There remain still to be mapped 15,291 square miles of the total area of the State, which will be represented on 66 atlas sheets. Of this unmapped area 43 atlas sheets, which include an area of 11,118 square miles, are now controlled by triangulation and precise leveling and are ready for the final topographic mapping. I earnestly recommend the enactment of legislation similar to that of the act of Legislature in chapter 559 of the Laws of 1903, calling for an additional appropriation of $20,000 for the continuation of this work.

Triangulation.—Mr. E. L. McNair, topographer, was in charge of a party which extended primary control by triangulation over a portion of Allegany county. In all his party occupied four stations, thus completing the control of an area of about 219 square miles. This will give the basis upon which the future topographic mapping of an additional sheet may be extended.

Traverse.—During the season the party under Mr. McNair was also engaged in extending control by primary traverse over certain areas in Oswego, Oneida and Erie counties. In all, this party ran 241 miles of such traverse and determined upon its route 26 astronomic azimuths for its adjustment. The results of this work were the procuring of such control over four additional atlas sheets and covering a total area of nearly 880 square miles, upon which the topographic mapping may hereafter be extended.

TOPOGRAPHIC SURVEYING.

During the past season Mr. J. H. Jennings, topographer, continued the general supervision of all topographic surveying in the State, under the direction of Mr. H. M. Wilson, geographer in charge. A large party commenced field work on Long Island early in April under the charge of Mr. J. M. Whitman, Jr., assistant topographer, assisted by Mr. Gilbert Young, assistant topographer as subchief. The personnel included Messrs. W. H. S. Morey and Charles Hartman, jr., field assistants; J. B. Gardner, O. C. Merrill, traversemen; George Seidel, J. T. Metcalf and F. M. Goodhue, levelmen, with the necessary rodmen. During the months of April and May these parties completed most of the control, including traverses and levels of the unmapped portions of the island, after which the force dispersed to other parts of the State. In the fall Mr. Jennings returned to Long Island, where with the assistance of Messrs. Whitman, Meade, Morey and a couple of traversemen and levelmen the fieldwork of mapping the island was completed. The drafting of this is now in progress and will be represented upon seven sheets, namely, Riverhead, Moriches, East Hampton, Sag Harbor, Shelter Island, Gardiner Island and Montauk Point.

Early in May Mr. Jennings, assisted by Mr. J. I. Gayetty, topographic aid, and aided at various times during the season by Messrs. W. H. S. Morey, field assistant, L. E. Tucker, C. F. Hastings, George Bailey, F. A. Dykeman, H. E. Weir and C. M. Donnell, traversemen; Messrs. Geo. Seidel, W. E. Greene, J. J. Doyle, G. M. Dimmick and B. S. Waring, levelmen, with the necessary rodmen, was in charge of a party engaged on the survey of certain areas in Wyoming, Livingston, Allegany, Oswego, Jefferson, Lewis, Oneida, Erie, Genesee and Onondaga counties. During the season this party completed the mapping of Mount Morris, Orwell, Taberg and Warsaw sheets. They completed the partial mapping of Highmarket sheet, and they extended much of the necessary preliminary control, including levels and traverse, over Attica, Depew, Belfast, Kasoag and Mexico quadrangles.

About the first of May Mr. Glenn S. Smith, topographer, commenced fieldwork in the Adirondacks, in the counties of Franklin, Hamilton and St. Lawrence. On this work he was assisted at various times by Messrs. J. M. Whitman, Jr., assistant topographer, W. O. Tufts, topographic aid, and I. M. Flocker, A. P. Meade, Jr., B. B. Alexander and A. C. Merrill, field assistants; Messrs. Fred Graff, Jr., L. E. Tucker and H. E. Weir, traverseman; and Messrs. H. F. Plumer and I. W. Petit, levelmen, with the necessary rodmen and guides. This party remained at work in the Adirondacks but a little over four months, during which time they completed the mapping of St. Regis quadrangle, and nearly completed that of Tupper Lake, besides securing all necessary traverse and control for Loon Lake quadrangle.

A party under Mr. C. C. Bassett, topographer, took the field in May for the mapping of portions of Broome, Chenango, Ulster, Sullivan and Orange counties. Mr. Bassett was assisted throughout the season by Mr. Charles Hartman, Jr., field assistant; Messrs. G. S. Vanderwerken and M. R. Frisbie, traversemen; Messrs. J. J. Doyle and G. M. Dimmick, levelmen, and the necessary rodmen. During the season they completed the mapping of Nineveh and Slide Mountain quadrangles, and the control by traverse and levels of Ellenville.

A party under Mr. W. H. Lovell, topographer, assisted at times by Messrs. C. F. Hastings, George Seidel and C. M. Donnell, completed the mapping of Clymer quadrangle, covering portions of Chautauqua county, and later with the assistance of Mr. J. I. Gayetty, the mapping of Jamestown quadrangle, covering portions of Chautauqua and Cattaraugus counties.

Mr. J. M. Whitman, Jr., with a few of his assistants, was transferred from Long Island early in May to fieldwork in the Adirondacks, where, with the aid of Messrs. F. T. Fitch, field assistant, and F. W. Lovejoy, Jr., traverseman, with rodmen and guides, he nearly completed the mapping of Piseco Lake quadrangle, and the control of Sageville quadrangle in Hamilton, Fulton and Herkimer counties.

SUMMARY OF FIELD WORK, 1903.

COUNTIES.	Sheets.	Topographers.	Number of days worked.	Area mapped square miles.	Trigonometric locations, number.	LEVELS.			Traverse, miles.
						Bench-marks, number.	Spirit levels, miles.	Elevations number.	
Chautauqua	Clymer	Lovell	29	222	....	....	.....	.....	......
Suffolk	East Hampton	Jennings, Meade	6	28	....	....	20	61	139
Suffolk	Gardiner's Island	Jennings, Meade	10	43	....	....	.....	.....	......
Chautauqua, Cattaraugus	Jamestown	Lovell, Gayetty	54	222	242	2	128	232	426
Suffolk	Moriches	Jennings, Whitman, jr., Young	29	203	....	3	156	285	666
Suffolk	Montauk Point	Jennings, Morey	9	19	....	....	.....	.....	50
Wyoming, Livingston, Allegany	Mount Morris	Jennings	45	220	141	1	191	385	575
Broome, Chenango	Nineveh	Bassett	41	222	25	....	183	397	279
Oswego, Jefferson, Lewis	Orwell	Jennings, Gayetty	99	216	....	....	.....	.....	390
Suffolk	Riverhead	Jennings, Whitman, jr., Meade	32	147	....	2	133	421	609
Suffolk	Sag Harbor	Jennings, Whitman, jr., Meade	10	82	....	....	78	207	170
Suffolk	Shelter Island	Jennings, Meade	6	62	....	....	27	68	43
Ulster, Sullivan	Slide Mountain	Bassett	76	222	271	6	124	352	595
Franklin	St. Regis	Smith, Tufts, Meade, Merrill, Flocker, Alexander, Graff	125	168	6	5	54	228	633
Oneida, Lewis	Taberg	Jennings, Gayetty	38	217	....	....	115	292	139
Wyoming, Livingston, Allegany	Warsaw	Jennings, Lovell	24	220	122	8	184	467	441
Total completely surveyed	....	....	633	2,513	807	27	1,343	3,895	5,155
Wyoming, Genesee, Erie	Attica	Jennings, Gayetty	.....	.....	....	7	244	539	42
Allegany	Belfast	Jennings, Lovell, Hartman	.....	.....	229	7	121	289	175
Erie	Depew	Jennings, Gayetty	.....	.....	....	7	169	630	40
Ulster, Orange, Sullivan	Ellenville	Bassett	.....	.....	273	7	161	382	608
Lewis	Highmarket	Jennings, Morey	3	6	....	....	.....	.....	......
Oswego, Oneida, Lewis	Kasoag	Jennings	.....	.....	....	....	.....	82	......
Franklin	Loon Lake	Smith	.....	.....	....	3	108	315	228
Oswego, Onondaga	Mexico	Jennings, Gayetty	.....	.....	....	6	263	884	600
Hamilton, Fulton, Herkimer	Piseco Lake	Whitman, jr., Fitch	71	59	....	....	.....	.....	347

Hamilton	Sageville	Whitman, jr.	.....	.....	110	....	.....	90	224
Franklin, Hamilton, St. Lawrence	Tupper Lake	Smith, Tufts, Whitman, jr., Meade, Merrill, Flocker, Morey, Alexander, Graff	77	169	....	4	87	381	329
Total partly surveyed			151	234	612	41	1,148	3,510	2,675
Triangulation.									
Allegany		McNair	9	*					
Primary Traverse.									
Oswego, Oneida, Erie		McNair	41	†					

* Four stations. Two signals.   † Twenty-six azimuth. 241 miles.

SPIRIT LEVELING.

Under the immediate direction of various topographers in charge of fieldwork, eighteen parties were engaged in running spirit levels over the areas under survey. This was done to determine the elevations and establish bench marks upon which to base the contour sketching of the areas mapped. In the course of this work 2,491 miles of levels were run and 68 permanent bench marks of bronze or alumnium were established. These levels are all connected with mean sea level as datum at Sandy Hook, through a system of precise levels. Appended hereto are the elevations and descriptions of such bench marks as were determined during the past two years and have since been adjusted.

SECONDARY LOCATIONS.

In the progress of topographic mapping horizontal control was established by planetable triangulation and road traverse. The positions of 1,419 points were accurately determined by trigonometric methods, the elevations of which were ascertained at the same time and in the same manner. In addition 7,830 miles of road traverse were run, and from these were located by intersection about 2,622 additional positions.

LAND CLASSIFICATION MAPS.

Manuscript maps showing portions of the mapped areas covered by timber, brush and cultivated crops, respectively, with statements of the kinds and percentage of the various woods and crops, have been prepared as heretofore. In the future the results of land classification surveys will be embodied in a series of maps as a faint green overprint shown on the topographic atlas sheet. This faint green overprint will not only be shown on such maps as are hereafter published, but may also be placed on all reissues of sheets published in the past.

OFFICE WORK, 1902-3.

During the office season of 1902-3 all of the atlas sheets completely mapped during the preceding season were drawn up and turned over to the engraver for publication. Those yet in the hands of the engraver include the following 14 sheets, representing a land area of 3,024 square miles:

SHEET NAME.	Counties.	Area square miles.
Boonville	Oneida, Lewis	217
Carthage	Lewis, Jefferson	215
Hobart	Schoharie, Delaware	221
Greene	Chenango, Broome, Cortland	221
Coventry	Chenango, Broome	221
Richmondville	Otsego, Schoharie	220
Batavia	Greene, Wyoming	219
Caledonia	Livingston, Genesee, Wyoming	219
Chautauqua	Chautauqua	220
Wayland	Livingston, Steuben	220
Long Lake	Franklin, Hamilton	215
Setauket	Suffolk	180
Saranac Lake	Franklin, Essex	214
Copake	Columbia, Dutchess	222
Total		3,024

In addition there remain in the hands of the engraver the following nine atlas sheets mapped in 1901-2, all of which will soon be ready for publication and issuance:

SHEET NAME.	Counties.	Area square miles.
Santanoni	Franklin, Essex	215
Gilboa	Schoharie, Delaware, Greene	221
Rosendale	Ulster	223
Margaretville	Delaware, Ulster, Greene	222
Honeoye	Monroe, Ontario, Livingston	219
Apalachin	Broome, Tioga	224
Pitcher	Cortland, Madison, Chenango	220
Harford	Cortland, Tioga, Broome	220
Binghamton	Broome	224
Total		1,988

PUBLISHED SHEETS.

At the time my last annual report was submitted there had been published 124 atlas sheets by the office of the United States Geological Survey, covering a total area of 22,206 square miles. Since then there have been completed by the engraving division of the above survey 25 additional sheets, as enumerated in the following list, thus making the total number of sheets published 149, and the total published area 27,105 square miles.

SHEET NAME.	Counties.	Area square miles.
Gloversville	Fulton, Hamilton	218
Phœnicia	Greene, Delaware, Ulster	222
Lassellsville	Herkimer, Hamilton, Fulton, Montgomery	218
Berne	Schenectady, Albany, Schoharie	220
Rosendale	Ulster	223
Gilboa	Schoharie, Delaware, Greene	221
Fire Island	Suffolk	85
Norwich	Madison, Chenango	220
*Mettawee	Washington	424
Canandaigua	Monroe, Ontario, Yates	219
Theresa	Jefferson	215
Owego	Tioga	223
Hammondsport	Steuben, Schuyler	221
Kinderhook	Rensselaer, Columbia	221
Alexandria Bay	St. Lawrence, Jefferson	134
Penn Yan	Yates, Steuben	220
Naples	Ontario, Yates, Steuben, Livingston	220
Richfield Springs	Herkimer, Montgomery, Otsego	219
Cortland	Cortland	220
Luzerne	Warren, Saratoga	217
Northport	Suffolk, Nassau	170
Babylon	Suffolk, Nassau	125
Big Moose	Herkimer, Hamilton	216
Blue Mountain	Essex, Hamilton	216
Raquette Lake	Hamilton	216
Total		4,899

TWO-MILE SERIES OF MAPS.

There have recently been issued the following named atlas sheets on the reduced scale of two miles to the inch, with all the topographic features shown thereon which are represented on the large scale one-mile sheets excepting the houses. . Each of these two-mile sheets is of the same dimensions as the one-mile sheet, and therefore represents within the same limits of paper four times the area or nearly 1,000 square miles, and is the result of reduction from the engraved plates of the component one-mile sheets.

There have been issued to date the Mettawee, which includes the reduced Fort Ann and Cambridge sheets; the Taconic, which includes the reduced Hoosic and Berlin sheets; the Housatonic, which includes the reduced Pittsfield and Sheffield sheets; the Passaic, which includes the reduced Staten Island sheet, and the Niagara, which includes the reduced Wilson, Olcott, Tonawanda and Lockport sheets.

Furthermore, there is in process of engraving and will soon be issued the Adirondack sheets, covering Lake Placid, Ausable,

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*Reduction of Fort Ann, Cambridge, N. Y., and Pawlet, Manchester, Vt.

Mt. Marcy and Elizabethtown sheets; the Watkins Glen sheet, including Watkins, Ithaca, Elmira and Waverly sheets; and the Fort Ticonderoga sheet, which includes Ticonderoga and Whitehall sheets.

NEW YORK.

TRIANGULATION STATIONS.

Mr. A. H. Thompson, geographer, extended triangulation westward from the vicinity of Olean nearly to the western border of the State, controlling 4 quadrangles in Cattaraugus and Chautauqua counties and he also located by triangulation 5 stations for the control of 2 quadrangles in Wyoming and Livingston counties.

Mr. Oscar Jones, topographer, controlled by triangulation the Carthage quadrangle in Lewis county by locating 5 stations from the line Elmer-Rock.

Mr. McNair controlled 2 fifteen-minute quadrangles in Genesee county by locating 5 stations from Conesus, Perry and Scottsville. Positions are given on the United States standard datum.

ALLEGANY COUNTY.

Davis.—Located in the northern part of Centerville township, about 2 miles north of Centerville village, on land owned by Milton Davis.

Station mark. A bronze triangulation tablet cemented in solid rock under center of signal.

Latitude 42° 31′ 02.22″. Longitude 78° 14′ 36.23″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Carpenter	176 40 39.24	356 40 09.55	4.2363363
Felch	227 29 55.55	47 38 39.19	4.3784343
Nunda	258 10 54.79	78 25 47.18	4.4878673

CATTARAUGUS COUNTY.

Foster.—Situated in the southern part of Mansfield Township, on a high hill about 1½ miles a little east of north from the village of Little Valley, on land owned by A. Forster.

Station mark: A sandstone post 40 by 6 by 6 inches set under center of signal 36 inches in the ground, with bronze triangulation tablet cemented in top of post.

Latitude 42° 15′ 57.91″. Longitude 78° 47′ 23.60″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Shutt	27 47 17.15	207 45 45.85	3.8248931
Tuy	104 24 10.02	284 18 42.06	4.0618700
McCarthy	278 32 59.92	98 37 03.83	3.9246544
Townsend	334 32 40.94	154 36 17.21	4.2356988

Learn.—Situated in Ischua township, 3 miles west of Bennett Creek postoffice on land owned by Mr. Learn.

Station mark: A copper bolt sunk in granite post 4 feet long; bolt marked "U. S. G. S. 478 N. Y."

Latitude 42° 14′ 13.27″. Longitude 78° 25′ 53.77″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Flatiron	2 37 16.90	182 36 45.90	4.3683237
Townsend	61 05 16.40	240 54 26.5	4.4047580
McCarty	95 23 17.70	275 12 54.38	4.3293244
Mullaly	110 05 03.20	289 54 18.15	4.3689371

McCarty.—Situated near the north line of Great Valley Township on a high hill 1½ miles a little west of north of Ellicottville village on land owned by Daniel McCarty.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground, and having a bronze triangulation tablet cemented in its top.

Latitude 42° 15′ 17.24″. Longitude 78° 41′ 20.91″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Townsend	3 44 48.06	183 44 15.72	4.1558183
Shutt	67 52 46.09	247 47 11.02	4.0914180
Foster	98 37 03.83	278 32 59.92	3.9246544
Mullaly	173 05 56.29	353 05 34.88	3.7830230
Learn	275 12 54.38	95 23 17.70	4.3293244

Mullaly.—Situated on a high hill about 2½ miles a little west of north from the village of Ellicottville, Ellicottville Township, on land owned by P. Mullaly.

Station mark: Stone post 40 by 6 by 6 inches set 36 inches in the ground, and having a bronze triangulation tablet cemented in its top.

Latitude 42° 18′ 32.42″. Longitude 78° 41′ 52.74″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Shutt	45 05 04.96	224 59 51.10	4.1794295
Tuy Hill	84 15 23.73	264 06 06.09	4.2751144
Learn	289 54 18.15	110 05 03.20	4.3689371
McCarty	353 05 34.88	173 05 56.29	3.7830230

Pine Hill.—Situated in lot 36 in Randolph Township, 4 miles south of the village of Randolph, on a high hill known as Pine Hill. Land owned by C. B. Bartlett.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground and having a bronze triangulation tablet cemented in its top.

Latitude 42° 06′ 17.90″. Longitude 78° 59′ 26.35″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Walrod	96 17 22.90	276 12 20.07	4.0185904
Highland	131 52 02.68	311 45 06.34	4.2811005
Tuy	194 33 14.35	14 35 52.35	4.3313226
Shutt	228 17 48.54	48 24 22.49	4.2560628
Townsend	264 17 50.31	84 29 30.93	4.3823034
Read	295 26 28.45	115 27 19.07	3.2836340

Read.—Situated in the southern part of Randolph Township, in lot 10 of Holland Company land survey, on a high hill known locally as "Mount Tuy." It is 5 miles south of village of East Randolph on land owned by B. Read.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground, in the center of top of which is cemented a bronze triangulation tablet.

Latitude 42° 05′ 51.14″. Longitude 78° 58′ 40.84″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Pine	115 27 19.07	295 26 28.45	3.2836340
Shutt	222 27 45.78	42 33 28.58	4.2399748
Townsend	261 46 44.90	81 57 34.84	4.3520529

Shutt.—Situated in the eastern part of Napoli Township close to the Napoli and Little Valley Township line and about 4 miles southwest of Little Valley Village, on a high hill owned by John Shutt, known locally as Shutts Hill.

Station mark: A stone post 40 by 6 by 6 inches set under center of signal 36 inches in the ground, in center of top of which is cemented a bronze triangulation tablet.

Latitude 42° 12′ 46.31″. Longitude 78° 49′ 39.40″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Foster	207 45 45.85	27 47 17.15	3.8248931
Read	42 33 28.58	222 27 45.78	4.2399748
Pine Hill	48 24 22.49	228 17 48.54	4.2560628
Tuy Hill	137 26 37.30	317 22 40.81	4.0760509
Mullaly	224 59 51.10	45 05 04.96	4.1794295
McCarty	247 47 11.02	67 52 46.09	4.0914180
Townsend	312 27 28.39	132 32 30.71	4.1538723

Townsend.—Situated in Salamanca Township on what is locally known as "Townsend Hill," about 3 miles southeast of Salamanca. There is a private road from the village of Salamanca to the station.

Tuy Hill.—Situated in the western part of New Albion Township, about 2 miles west of the village of New Albion, on a high hill known locally as Tuy Hill.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground under center of signal; in center of top of post is cemented a bronze triangulation tablet.

Latitude 42° 17′ 30.59″. Longitude 78° 55′ 31.11″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Foster	284 18 42.06	104 24 10.02	4.0618700
Mullaly	264 06 06.09	84 15 23.73	4.2751144
Pine	14 35 52.25	194 33 14.35	4.3313326
Walrod	38 49 59.78	218 42 18.39	4.4007680
Highland	67 50 11.25	247 40 35.99	4.3260574
Shutt	317 22 40.81	137 26 37.30	4.0760509

Bates.—Located in the northwestern part of Harmony Township on a commanding hill owned by George C. Bates, about one-fourth mile from the road between Sherman and Harmony townships.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground, in the center of top of which is cemented a bronze triangulation tablet.

Latitude 42° 30′ 24.02″. Longitude 79° 31′ 24.55″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Clymer	29 53 24.01	209 50 37.21	4.0600192
Dewey	77 07 15.77	257 05 29.53	3.5717872
Caselar	158 49 07.99	338 48 11.00	3.7317280
Haynes	235 16 22.46	55 22 58.15	4.2159901
Highland	253 26 35.25	73 35 06.77	4.4923832
Meas	270 06 18.84	90 18 08.34	4.3853254
Panama	356 56 53.53	176 57 05.88	3.9004001

Busti.—Located in the southeastern corner of Busti Township, about 2 miles a little east of south from the village of Busti, on a commanding ridge on land owned by C. Meredith.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground, in the center of top of which is cemented a bronze triangulation tablet.

Latitude 42° 06′ 32.55″. Longitude 79° 16′ 25.26″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Panama	108 08 36.83	287 58 46.96	4.3286072
Meas	194 05 59.78	14 07 45.77	4.1734905
Highland	201 20 39.98	21 25 02.32	4.4000139
Walrod	227 50 04.10	47 56 24.17	4.2451027

Caselar.—Located in the southwestern corner of Chautauqua Township, on land owned by Mr. Caselar.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground, in the center of top of which is cemented a bronze triangulation tablet.

Latitude 42° 11′ 06.96″. Longitude 79° 32′ 49.45″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Dewey	16 03 44.36	196 02 55.06	3.7851533
Haynes	254 18 23.71	74 25 56.60	4.2057444
Bates	338 48 11.00	158 49 07.99	3.7317280

Clymer (not occupied).—About 3 miles northwest of the village of Clymer.

Station mark: A tall oak tree standing alone and in full view from all the surrounding country.

Latitude 42° 03′ 01.31″. Longitude 79° 35′ 33.37″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Dewey	192 49 38.79	12 50 39.43	3.9712038
Bates	209 50 87.21	29 53 24.01	4.0600192
Panama	251 47 45.19	71 50 43.22	3.8107174

Dewey.—Located in Sherman Township, about 2 miles southeast of Sherman village, on land owned by Mr. Dewey.

Station mark: An aluminum bolt buried 16 inches in the ground; surface mark, a large bowlder over bolt.

Latitude 42° 07′ 57.04″. Longitude 79° 34′ 02.91″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Clymer	12 50 39.43	192 49 38.79	3.9762038
Caselar	196 02 55.06	16 03 44.36	3.7851533
Bates	257 05 29.53	77 07 15.77	3.5717872

Haynes.—In the northern part of Ellery Township, about 3 miles north of Ellery Center and one-eighth mile east of road leading from Ellery Center to Stockton. Land owned by Mrs. Eliza Haynes.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground.

Latitude 42° 13′ 27.20″. Longitude 79° 21′ 35.28″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Bates	55 22 58.15	235 16 22.46	4.2159901
Caselar	74 25 56.60	254 18 23.71	4.2057444
Highland	271 43 57.27	91 51 53.50	4.2111548

Highland.—Located in the western part of Ellington Township, 3 miles directly west of Ellington village, on Highland farm owned by Morrill Hoag. Commands views of whole country except directly north.

Station mark: A stone post 36 by 6 by 6 inches set 36 inches in the ground under center of signal.

Latitude 42° 13′ 10.66″. Longitude 79° 09′ 46.40″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Busti	21 25 02.32	201 20 39.98	4.4000139
Meas	31 44 22.96	211 41 41.49	4.0211111
Bates	73 35 06.77	253 20 35.25	4.4923832
Haynes	91 51 53.50	271 43 57.27	4.2111548
Tuy	247 40 35.90	67 50 11.25	4.3260574
Pine	311 45 06.34	131 52 02.68	4.2811005
Walrod	341 31 30.63	161 33 32.85	4.0873636

Meas.—Located near the center of Elicott Township on a high ridge about 3 miles north of the city of Jamestown and one-third miles south of the Jamestown and Ross Mills road. Land owned by P. A. Melquist.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in ground and having a bronze triangulation tablet cemented in top.

Latitude 42° 08′ 21.22″. Longitude 79° 13′ 47.09″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Busti	14 07 45.77	194 05 59.78	4.1734905
Panama	71 53 22.33	251 41 45.66	4.4002458
Bates	90 18 08.34	270 06 18.84	4.3853254
Highlands	211 41 41.49	31 44 22.96	4.0211111
Walrod	285 49 02.01	105 53 36.45	3.9898545

Panama.—In the western part of Harmony Township 2 miles a little south of west from Panama village on land owned by J. Brooker.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground, in the center of top of which is cemented a bronze triangulation tablet.

Latitude 42° 04′ 06.70″. Longitude 79° 31′ 06.14″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Clymer	71 50 43.22	251 47 45.19	3.8107174
Bates	176 57 05.88	356 56 53.53	3.9004001
Meas	251 41 45.66	71 53 22.33	4.4002458
Busti	287 58 46.96	108 08 36.83	4.3286072

Walrod.—Located near the center of Poland Township on a low, bluff-like hill, south of Conewango Creek and about two miles south of Kennedy village on land owned by P. Walrod. View not good to southeast but fine in all other directions.

Station mark: A stone post 40 by 6 by 6 inches set under center of signal 36 inches in ground, having a bronze triangulation tablet cemented in its top.

Latitude 42° 06′ 54.72″. Longitude 79° 06′ 57.95″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Busti	47 56 24.17	227 50 04.10	4.2451027
Meas	105 53 36.45	285 49 02.01	3.9898545
Highland	161 33 32.85	341 31 39.63	4.0873636
Tuy Hill	218 42 18.39	38 49 59.78	4.4007680
Pine Hill	276 12 20.07	96 17 22.90	4.0185994

GENESEE COUNTY.

Leroy (not occupied).—Station mark: Center of standpipe.

Latitude 42° 58′ 37.1″. Longitude 77° 59′ 47.5″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Attica	....	....	4.40362
Conesus	....	....	4.60530
Scottsville	....	....	4.37105

JEFFERSON COUNTY.

Carthage (not occupied).—Station mark: Center of water-supply standpipe.

Latitude 43° 59′ 02.38″. Longitude 75° 36′ 16.95″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Croghan	295 24 55.6	115 33 44.7	4.27491
Rock	318 58 20.2	139 [illegible]	4.47068

M'Quillen.—Station on a bare, rocky hill [illegible] Mount M [illegible] Quillen, 1 mile northeast of Carthage, on p [illegible] Mrs. Ann [illegible] Harvey, who lives 500 yards west of statio [illegible] iew in a [illegible] directions.

Station mark: A br [illegible] triangulation t [illegible] nted in solid rock.

Latitude 43° 59′ 49.70″. Lo [illegible] 27.82″.

To station.	[illegible]	Back azi [illegible] ° ′	[illegible] dist [illegible]
Smith	[illegible]	225 40 38 [illegible]	[illegible]
Mound	[illegible]	116 03 55 [illegible]	[illegible]
Croghan (new station)	3 [illegible]	[illegible] 21 05 43.2	[illegible]
Denmark Church	355 [illegible]	[illegible] 22 34.3	[illegible]

Mound (not occupied).—A well-defined granite mound sometimes known as Mount Tom, 5 miles southeast of Carthage, about one-fourth mile to the north of the Forest City or State road. The Carthage city electric-light pole line passes almost over the mound and near the residence of James Dalton.

Station mark: Center of mound.

Latitude 43° 57′ 55.26″. Longitude 75° 30′ 03.34″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Smith	80 09 40.3	260 02 48.9	4.12776
McQuillen	116 03 55.6	296 00 10.3	3.90571

Smith.—On the east side of an east-and-west timbered ridge 4 miles southwest of Carthage, one-half mile north of outlet of Pleasant Lake. Property of William Smith, who lives one-fourth mile south of station. View cut off from north 70° west around by north to north 45° east.

Station mark: Center of elm tree 12 inches in diameter, about which is piled a mound of stones. Tree in center of field, 300 feet from timber.

Latitude 43° 56′ 40.52″. Longitude 75° 39′ 56.28″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Mound	260 02 48.9	80 09 40.3	4.12776
Croghan	279 33 43.7	99 45 04.7	4.34658
Elmer	335 44 13.5	155 47 08.0	4.13634

LEWIS COUNTY.

Croghan (new station).—Croghan Church located by Mr. edge Tatum, topographer, in 1900, destroyed by fire.

he new station is on south end of a rocky ridge, 1 mile north he vilage of Croghan, west side of Beaver River, on property ristopher Parquet, who lives one-fourth mile east of sta-

mark: A bronze triangulation tablet set in solid

Latitude 43° 54′ 39.80″. Longitude 75° 23′ 34.64″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Elmer	61 49 24.3	241 49 24.3	4.26717
Denmark Church	84 01 45.2	263 53 58.7	4.17885
Smith	99 45 04.7	279 33 43.7	4.34658
Carthage	115 33 44.7	295 24 55.6	4.27491
McQuillen	121 05 43.2	300 57 28.2	4.26850
Rock	350 35 27.7	170 36 40.7	4.15885

Denmark Church (not occupied).—A large, white, square tower on church in the village of Denmark. Station mark: Center of tower.

Latitude 43° 53′ 48.38″. Longitude 75° 34′ 47.34″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
McQuillen	175 22 34.30	355 22 06.2	4.04878
Croghan	263 53 58.7	84 01 45.2	4.17885

Elmer.—Seven miles northwest of Lowville, N. Y., in the town of Harrisburg, 1 mile south of Harrisburg postoffice, on land owned by E. G. Elmer, who lives 300 yards north of station.

Station mark: A marble post 48 by 8 by 8 inches set 36 inches in the ground, and in the center of top is cemented a bronze triangulation tablet.

Latitude 43° 49′ 56.12″. Longitude 75° 35′ 44.54″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Smith	155 47 08.0	335 44 13.5	4.13634
Croghan (new station)	241 40 58.5	61 49 24.3	4.26717
Rock	286 14 32.9	106 24 11.0	4.28901

Rock.—On a high, rocky ridge, in Watson Township, 8 miles east of Lowville, on land owned by George Venatti.

Station mark: A bronze triangulation tablet cemented in solid rock.

Latitude 43° 46′ 58.98″. Longitude 75° 21′ 49.26″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Gum	32 23 03.2	212 18 07.9	4.25241
Elmer	106 24 11.0	286 14 32.9	4.28901
Carthage	139 08 21.7	318 58 20.2	4.47068
Croghan	170 36 40.7	350 35 27.7	4.15885

LIVINGSTON COUNTY.

Caledonia (not occupied).—Station mark: Center of standpipe.

Latitude 42° 58′ 29.8″. Longitude 77° 51′ 59.9″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Scottsville			4.11607
Conesus			4.52169

Culley.—About 2 miles northwest of Lakeville, on low knoll with timber on northeast side, on land owned by R. H. Culley. Station is on east and west fence line, 7 feet west of north and south fence line and 30 feet west of center of road.

Station mark: A small round bowlder set 1 foot below surface of ground. In top of bowlder is drilled a hole one-fourth inch deep. Over the bowlder is set a bronze triangulation tablet which is covered with earth and a stone on the surface.

Latitude 42° 51′ 2.48″. Longitude 77° 44′ 18.18″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Perry			4.42857
Conesus			4.20339

Nunda.—Situated in the town of Nunda on the highest part of what is locally known as East Hill.

Station mark: A bowlder 30 inches in diameter sunk flush with ground. In center of top is cemented a triangulation tablet. Station number, 514.

Latitude 42° 34′ 24.22″. Longitude 77° 52′ 47.36″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Davis	78 25 47.18	258 10 54.79	4.4878673
Carpenter	109 34 18.32	289 18 54.91	4.5179208
Felch	128 32 12.16	308 26 02.46	4.2013176
Perry	147 23 40.42	327 16 44.05	4.4136080
Ridge	165 22 48.65	345 21 19.84	4.0730232

Retsof (not occupied).—Station mark: Center of tallest brick chimney at the salt works.

Latitude 42° 50′ 5.1″. Longitude 77° 53′ 00.0″.

To station.	Azimuth.	Back azimuth.	Log. dist. meters.
	° ′ ″	° ′ ″	
Culley			4.07855
Retsof			4.36686

WYOMING COUNTY.

Attica.—Situated in town of Attica, about 1 mile east of Attica Center on bare hill, on land owned by Charles H. Weber. Date postoffice. Outlook good except to north.

Station mark: A triangular sandstone 8 inches thick and about 2 feet on each edge in top of which is cemented a bronze triangulation tablet. The stone is buried 1 foot below surface of ground.

Reference marks: (1) A round bowlder containing about 1 cubic foot at west edge of stone pile. Hole drilled 2 inches deep in top. Distance, 166 feet. True azimuth, 239½°. (2) A hole drilled 1½ inches deep in top of irregular-shaped bowlder embedded in ground. Surface exposed about 30 by 18 by 6 inches. Distance, 167½ feet. True azimuth, 47¼°. (3) A hole drilled 1½ inches deep in bowlder embedded in ground, about 12 by 12 by 4 inches exposed. Distance, 50 feet. True azimuth, 117½°.

Latitude 42° 48′ 48.83″. Longitude 78° 12′ 45.94″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Cobble	1 58 10.52	181 57 59.70	4.0232432
Leroy	....	....	4.40362
Scottsville	....	....	4.66248
Conesus	....	....	4.68021
Perry	289 42 24.00	109 49 08.00	4.15762

Carpenter.—Located in Weathersfield Township, about 2½ miles northwest of the village of Hermitage, on land owned by B. H. Carpenter on a high, gravelly knoll one-eighth mile south of road leading from Gainesville to North Java.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in ground with bronze triangulation tablet cemented in top.

Latitude 42° 40′ 19.74″. Longitude 78° 15′ 20.09″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Davis	356 40 09.55	176 40 39.24	4.2363363
Perry	237 27 30.84	57 35 59.21	4.3055437
Felch	273 14 00.52	93 23 14.66	4.2706937
Nunda	289 18 54.91	109 34 18.32	4.5179208

Cobble.—On a high, rocky knoll, locally known as Cobble Knoll, in lot 11, Orangeville Township, 1½ miles southwest of the cross-roads known as Orangeville Center.

Station mark: A stone post 40 by 6 by 6 inches set 36 inches in the ground; in the top is cemented a bronze triangulation tablet.

Latitude 42° 43′ 07.18″. Longitude 78° 13′ 01.86″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Perry	247 42 28.64	67 49 23.48	4.1766165
Attica	181 57 59.70	1 58 10.52	4.0232422

Felch.—Located in Castile Township, on land owned by William Felch, about 2 miles northeast of Castile village, on a small rocky knoll, about one-eighth mile east of the Castile and Perry road.

Station mark: A bronze triangulation tablet cemented in solid rock under center of signal.

Latitude 42° 39′ 44.84″. Longitude 78° 01′ 42.47″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Nunda	308 26 02.46	128 32 12.16	4.2013176
Davis	47 38 39.19	227 29 55.55	4.3784343
Carpenter	93 23 14.66	273 14 00.52	4.2706937
Perry	172 34 57.57	352 34 11.18	4.0801722

Perry.—Situated in the town of Perry, 2 miles northwest of Perry Center, on the top of a small hill on the farm of Alfred McWethey. The geodetic point is near the north line fence dividing the farms of Mr. McWethey and Mr. William Fish.

Station mark: A cut stone post 30 by 6 by 6 inches, set 27 inches in the ground. In center of top is cemented a bronze triangulation tablet.

Station number, 513.

Latitude 42° 46′ 11.35″. Longitude 78° 02′ 50.76″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Ridge	313 17 28.44	133 22 56.22	4.1793698
Nunda	327 16 44.05	147 23 40.42	4.4136080
Felch	352 34 11.18	172 34 57.51	4.0801722
Carpenter	57 35 59.21	237 27 30.84	4.3055437
Cobble	67 49 23.48	247 42 28.64	4.1766165
Attica	109 49 08.00	289 42 24.00	4.1576200
Perry Center	305 38 49.38	125 40 26.73	3.6034672

PERRY CENTER CHURCH SPIRE.

Latitude 42° 44′ 55.57″. Longitude 78° 00′ 27.38″.

To station.	Azimuth. ° ′ ″	Back azimuth. ° ′ ″	Log. dist. meters.
Perry	125 40 26.73	305 38 49.38	3.6034672
Ridge	316 03 45.00	136 07 35.82	4.0472403

MERIDIAN MARKS.

LITTLE VALLEY, CATTARAUGUS COUNTY.

Location of station: In the courthouse grounds, near the southwest corner of same.

Station mark: A stone post 48 by 8 by 8 inches set 40 inches in the ground, in the center of top of which is cemented a bronze meridian tablet.

Distant mark: North of station 456 feet, near the northeast corner of grounds a stone post similar to station mark set 40 inches in the ground.

MAYVILLE, CHAUTAUQUA COUNTY.

Location of station: In schoolhouse grounds, near the southwestern line.

Station mark: A stone post 50 by 8 by 8 inches set 40 inches in the ground, 125 feet from street line. In the center of top of post is cemented a bronze meridian tablet.

Distant mark: North of station 369.8 feet a stone post 50 by 8 by 8 inches set 40 inches in the ground, 25 feet from street line. In center of top of post is cemented a bronze meridian tablet.

WARSAW, WYOMING COUNTY.

Location of station: In the western side of the public school grounds.

Station mark: A stone post 48 by 8 by 8 inches set 40 inches in the ground, in the center of top of which is cemented a bronze meridian tablet.

Distant mark: North of station 598.2 feet, a stone post similar to station mark set 40 inches in the ground.

PRIMARY TRAVERSE.

The following geographic positions for control of the Highmarket and Orwell quadrangles were obtained by primary traverse run in 1902 by Mr. Oscar Jones, topographer. The line starts at Gum triangulation station and follows highways westward to Lowrey triangulation station, thence southward via Thomas triangulation station to Florence triangulation station, and finally eastward and northward to the starting point.

Geographic positions along highways between Gum and Lowrey triangulation stations.

Station.	Latitude.	Longitude.
	° ′ ″	° ′ ″
Gum triangulation station	43 38 49.5	75 28 56.6
Road to right	43 39 25.0	75 29 08.7
Turin and Martinsburg, township line between	43 39 56.5	75 29 54.0
Crossroads and railroad crossing	43 40 32.5	75 29 44.8
Road right	43 41 23.7	75 28 52.5
Road right	43 41 15.0	75 30 12.0
Schoolhouse, road left at	43 42 32.8	75 29 35.3
Road corners	43 42 82.4	75 30 54.9
Road east and west	43 43 23.3	75 31 10.2
Road forks	43 48 35.4	75 32 22.9
Road east and west	43 44 09.5	75 32 32.6
Road left	43 44 04.3	75 33 55.5
Road left	43 43 59.9	75.35 14.5
Road right	43 43 59.3	75 35 25.7
Widow Williams, opposite residence of	43 43 52.9	75 37 26.3
Highmarket and Montague, town line between	43 43 57.3	75 38 24.8
Road right	43 44 00.1	75 38 39.0
Road crossing	43 43 53.4	75.41 20.3
Creek right	43 43 02.0	75 41 14.1
Branch right	43 42 45.5	75 42 08.6
Salmon River road	48 42 31.6	75 43 58.4
Salmon river, center of bridge	43 41 39.4	75 44 33.5
Creek right	43 40 30.4	75 45 13.2
Montague and Highmarket, town line between	43 39 26.9	75 46 07.1
Oswego and Jefferson, county line between	43 39 21.8	75 46 13.1
Creek right	43 39 17.3	75 46 18.3
Creek left	43 38 57.7	75 46 40.9
Salmon river	43 39 09.9	75 48 51.5
Creek left	43 38 57.1	75 50 14.9
Greenboro postoffice, road at	43 38 37.5	75 53 20.8
Sandy creek, road on left	43 39 11.1	75 53 58.7
Redfield and Boylston, town line between	43 39 11.8	75 53 59.2
Crossroads	43 39 56.5	75 54 40.7
Road left	43 40 56.8	75 55 23.2
Road left, leave State road, run west	43 41 45.9	75 56 03.2
Crossing county line and State road	43 42 00.0	75 56 13.1
Road left	43 41 23.7	75 58 20.2
North Boylston church, road corner at	43 41 01.2	76 00 06.6
Boylston triangulation station, flag on stump	43 40 43.1	76 00 03.8
Lowrey triangulation station (spur line from station 245)	43 41 47.4	75 59 55.9

Geographic positions along highways between Boylston and Thomas triangulation station.

Station.	Latitude.			Longitude.		
	°	′	″	°	′	″
Crossroads	43	40	19.4	75	58	16.4
Crossroads	43	39	36.2	75	57	53.0
Smartville postoffice, crossroads at	43	38	28.9	75	57	44.9
Road left	43	37	28.9	75	58	27.2
Road right	43	37	14.5	75	58	25.5
Boylston and Orwell, town line between	43	36	35.3	75	58	21.9
Crossroads	43	36	03.5	75	58	19.6
Road right	43	35	27.7	75	58	17.4
Orwell and Redfield square, junction of roads	43	34	33.7	75	58	10.0
Thomas triangulation station	43	34	36.4	75	58	54.1

Geographic positions along highways between Thomas and Florence triangulation stations.

Station.	Latitude.			Longitude.		
	°	′	″	°	′	″
Schoolhouse, road on left at	43	34	26.8	75	57	45.0
Road forks	43	33	33.0	75	55	08.9
Crossroads	43	33	06.3	75	55	01.6
Creek right	43	33	08.3	75	53	59.4
Orwell and Redfield, town line between	43	33	05.4	75	53	28.1
Creek right	43	32	32.9	75	52	34.9
Schoolhouse, road on left at	43	32	14.6	75	51	28.2
Salmon River, center of bridge	43	32	05.3	75	51	04.4
Road right	43	31	59.8	75	50	50.3
Redfield, crossroads at	43	31	59.0	75	49	18.5
Road right	43	31	54.5	75	49	03.5
Road forks	43	31	43.0	75	48	39.0
Schoolhouse, road right at	43	31	29.8	75	47	51.0
Salmon River, center of bridge	43	31	27.0	75	47	14.4
Oswego and Lewis county line, road to right on	43	31	02.9	75	45	35.4
Road forks	43	31	57.9	75	44	50.8
Road right	43	31	54.4	75	44	03.1
Road forks	43	31	50.2	75	43	05.4
Road right	43	31	12.6	75	43	10.7
Osceola, crossroads at	43	30	00.7	75	43	21.0
Road right	43	29	23.7	75	43	26.5
Road left	43	29	05.4	75	43	28.9
Crossroads	43	28	14.3	75	43	36.2
Lewis and Oneida county line, road to left on	43	27	49.7	75	43	40.2
Creek left	43	27	00.0	75	44	06.8
Road left	43	26	33.6	75	44	15.8
Road forks	43	26	23.2	75	44	54.9
Florence, road forks at	43	26	18.3	75	45	00.7
Road left	43	24	51.7	75	43	26.8
Road left	43	24	15.8	75	43	04.3
Crossroads	43	23	33.0	75	42	26.1
Road forks	43	23	43.8	75	42	04.0
East Florence, road right	43	23	48.4	75	41	21.2
Florence triangulation station	43	23	14.5	75	39	36.3

Geographic positions along highways from Osceola, via Highmarket, to Gum triangulation station.

Station.	Latitude. °	′	″	Longitude. °	′	″
Road right	43	29	57.7	75	42	38.7
Branch right	43	30	28.8	75	41	45.6
Creek right	43	30	30.8	75	40	46.5
Creek right	43	29	44.7	75	39	31.0
Osceola and Lewis, town line between	43	29	33.3	75	39	19.5
Salmon River right	43	29	21.4	75	39	06.2
Lischers Mill, road right at	43	29	07.8	75	38	18.4
Schoolhouse, forks of road at	43	27	44.4	75	36	12.4
Road forks	43	26	56.8	75	34	57.1
Creamery, forks of road at	43	26	57.3	75	34	49.2
Road forks	43	26	58.0	75	34	27.8
Branch left	43	28	07.2	75	33	45.9
Road forks	43	29	01.1	75	33	21.1
West Leyden, road right to	43	29	19.9	75	33	07.9
Road forks	43	30	54.7	75	31	51.6
Fish Creek, crossroads at	43	31	14.9	75	32	06.7
Road right	43	31	34.2	75	31	36.0
Road left	43	31	59.0	75	31	17.0
Road left	43	32	57.6	75	30	44.7
Barnes Corners, crossroads at	43	33	09.2	75	30	32.0
Road left	43	34	38.2	75	31	21.1
Highmarket postoffice, forks of road at	43	35	06.5	75	31	08.1
Creamery, forks of road at	43	35	20.8	75	31	36.3
Road forks	43	36	20.0	75	31	49.4
Branch left	43	37	32.5	75	31	40.3
Road forks	43	38	13.5	75	31	27.9
Road forks	43	37	55.3	75	30	44.6
Gum triangulation station	43	38	49.5	75	28	56.6

SPIRIT LEVELING.

Beginning with the season of 1896 the field parties engaged in the topographic mapping have conducted careful spirit leveling on a scale more extended and of a quality more accurate than had ever before been attempted by the United States Geological Survey. This was in pursuance of the act of Congress providing for the sundry civil expenses of the government for the fiscal year 1896-97, a paragraph of which is as follows:

"For topographic surveys in the various portions of the United States.—*Provided,* That hereafter in such surveys west of the ninety-fifth meridian, elevations above a base level located in each area under survey shall be determined and marked on the ground by iron or stone posts or permanent bench marks, at least two such posts or bench marks to be established in each township or equivalent area, except in the forest clad and mountain areas, where at least one shall be established, and there shall be placed, whenever practicable, near the township corners of the public land surveys; and in the area east of the ninety-fifth meridian at least one such post or bench mark shall be similarly established in each area equivalent to the area of a township of the public land survey."

It was realized by the framers of the above act that it would be impossible to establish accurately and mark correctly on the monuments their exact height above the sea level. Any attempt to do this would have necessitated the running of thousands of miles of precise levels in order to connect with sea level the initial points within the various areas under topographic survey, and this would cost immense sums and have occupied several years, during which the topographic surveys would have continued without being accompanied by spirit leveling and the establishment of the bench marks required. The act was therefore so framed as to permit of the acceptance of some point within each area under topographic survey as a central datum point for that area, and the elevation of the initial bench mark established there was determined as nearly as practicable from existing elevations adjusted through by railway levels or other levels brought from the sea. In consequence, though all the elevations connected with the same central datum point will agree one with the other, yet they will not be reduced to exact sea level because of the differences between the primary elevations upon which leveling in the various localities is based. Precise level lines have been extended by this bureau and other organizations, prior and since 1896, to more accurately determine the elevations above sea level, and the elevations originally determined have been corrected from time to time in publications, so that each central point will ultimately be reduced more accurately to mean sea level datum carrying with it all the levels resting thereon.

It was decided in 1896 that in addition to determining the elevations of these bench marks they should be instrumentally connected with the horizontal measurements taken in the course of topographic surveys, but only with such accuracy as would permit of their being properly platted on the resulting maps, the location and elevation of these bench marks being published in two ways: First, by approximate symbol on the atlas sheets, the letters B. M., and the elevation to the nearest foot. Second, by lists of bench marks with a full description of each bench mark and its exact elevation above sea level to the thousandth of a foot, as adjusted and referred to the various central datum points, these lists to be corrected in publications from time to time as better connections are made with sea level.

It was thought that these bench marks should be of the most attractive and substantial character consistent with reasonable cost, and after examination of the various forms used by other government and city surveys three standard styles were selected: First, a circular bronze or aluminum tablet, 3½ inches in diameter and ¼-inch thick, appropriately lettered, having a 3-inch stem to be cemented into a drill hole in the vertical walls of public buildings, bridge abutments, or other substantial masonry structures. This was first used only for the central datum points and in such places as call for an attractive bench marks, but recently have been used also in place of the second form which has now been discontinued. This second form consisted of a copper bolt 4 inches long and 1 inch in diameter, fastened into either masonry or solid rock by driving it on a brass wedge placed in the bottom of a vertical drill hole, so that the surface of the bolt is horizontal and forms the zero of the bench mark. The third form to be employed where masonry rock is not accessible consists of hollow wrought iron posts, 4 feet in length and 3½ inches in outer diameter, split at the bottom and expanded to 12 inches, so as to prevent both the easy subsidence of the post and its being maliciously pulled out of the ground. The iron is heavily coated with hot asphalt, and over the top of the post is riveted a bronze tablet similar to that first described. These posts are set in the earth with only one foot of their length projecting above the surface, and whenever possible a flat stone is placed in the bottom as a suitable rest.

In order that these bench marks should be so marked as to fulfill the apparent intention of Congress and supply the popular demand by showing approximate elevation above mean sea level it was decided that they should not be given ordinary serial numbers, but that the approximate elevation to the nearest foot should be stamped upon them, and these figures should constitute their numbering. It was soon found, however, that the assumed elevation above sea level as determined for a given point might be changed during a season or within a few seasons, and that this might change by several feet the relative elevations stamped upon two bench marks adjacent one to the other. To satisfy both conditions, therefore, the popular demand for sea level heights and the scientific demand for exact differences between adjacent bench marks the following method was adopted:

The elevations above mean sea level to the nearest foot, as determined at the time of running levels, is stamped upon the bench mark, and, in addition, an abbreviation of the name of the central datum point. Thus, for an elevation depending on North Creek, the mark would be, say "1728 N.C.", tablet or iron post. As this datum has been found to be in error about 5 feet, later bench marks established in that neighborhood were marked as though resting upon a different datum, that of Albany, from which the check was obtained, and the next bench mark to that above cited may be stamped "1810 A." An engineer running between these two and finding them out according to his levels by 5 feet will at once realize that the letters "N.C." or the letter "A" carries some special meaning, and will doubtless at once write to the office of the United States Geological Survey to inquire what it was, when the desired information will be furnished.

The primary leveling is done by first-class methods, but not of such quality as would classify it as precise or geodetic leveling. In order to check and eliminate the errors incident to such work, all lines of levels run within an area under topographic survey are arranged so as generally to close back on themselves in circuits or polygonal figures, these lines being run by a single levelman and rodman; the closure of various circuits then leads at once to the detection of any gross error. Unusually long or important lines are run by a levelman and two rodmen in such manner as to make a duplicate rodded line.

In order to establish as nearly uniform grade of accuracy for the work as practicable, general instructions have been issued to the levelmen, and printed in the "Instructions" governing the topographic branch of the United States Geological Survey and reprinted herewith. The allowable limit for closure error for good work is set as $0.05 \sqrt{D}$ feet in which D represents the length of the line or circuit in miles.

The instruments in general use are 20-inch engineer's levels and New York rods made by Messrs. W. & L. E. Gurley and furnished with plumbing levels and with a specially constructed foot plate. It is believed that the results obtained fully justify the wisdom of the selection. The only change made in the rods from those regularly furnished was in making the foot plate a truncated pyramid of brass, the bottom of which is but one-half inch in width. This was in order to keep it freer of dirt and to compel its being placed more accurately on the top of the steel turning peg. The only change from the regular form made in the instrument is in increasing the sensitiveness of the level bubble so that one division on the peg equals ten seconds of arc. All turning points must be on steel pegs at least 12 inches in length and driven firmly into the ground.

In addition to the ordinary primary and flying levels the United States Geological Survey has run several lines of precise levels most of which form elements in the precise leveling net extending from the Atlantic coast to the Gulf of Mexico, which comprises in addition the work of the Corps of Engineers, the United States Coast and Geodetic Survey, the Lake Survey, the Deep Waterways Commission and the Pennsylvania and the Baltimore and Ohio Railroad companies.

The precise leveling instruments used by the United States Geological Survey were made by Messrs. Buff and Berger of Bos-

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[illegible] ough [illegible] from a different datum, that of Albany, from [illegible] which the datum was obtained, and the next bench mark to th[illegible] was cited may be stamped "2140 A." An engineer run[illegible] between these two and finding them out according to his [illegible] feet [illegible] that the letters "X.C." or the [illegible] carries some special meaning, and will doubtless [illegible] the office of the United States Geological Survey [illegible] what it was, when the desired information will be fou[illegible]

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ton, and differ from the ordinary spirit levels in many particulars, the effect of which is to make them high grade instruments of precision, 8″ and 4″ bubble tubes being used. The rods are of special design, 10 feet long, double-faced target reading and non-extensible, and were made by Messrs. W. & L. E. Gurley of Troy, from selected white pine treated with boiling paraffin or linseed oil. The lines were run with two rods and rodmen, an umbrellaman, sometimes with an additional laborer. Instructions for the conduct of the work differed from those for primary work in the following essential points:

The instrument is at all times shaded from the wind and sun; fore and back sights are of exactly equal length and no sight over 300 feet in length is permitted except in special cases. The instrument is unclamped from the tripod after the legs have been firmly set. Four steel turning points are used at the same time, two for each rodman, and they are so used that those employed for back sights are not withdrawn until the fore sight pegs have been used; thus, the line depends at no time on the stability of the instrument, as there are always two turning points in the ground. The limit of apparent error in the work is fixed at $.03 \sqrt{\text{distance in miles}}$, which represents the allowable difference, in feet, in the elevation of any bench mark as determined by the duplicate lines. This limit is about as high as that set by other Government surveys for the best class of geodetic leveling. The methods of precise leveling used by the United States Geological Survey may be known as simultaneous double-rodding. It consists of two level lines carried along at one time on separate sets of steel pins about a foot in length driven firmly in the ground. The rodmen occupy alternate stations and the opposite faces of the rods are used with opposite end bearing plates for separate lines. The back sights are read first on one line and the fore sights are read first along the other line. On one or two of the first lines ran the rods were self-reading on one side and targeted on the other, but the later rods were double targeted and the targets are controlled by steel tapes as belts, passing over wheels at either end, for quick setting, the targets being then clamped and the closer setting effected by the use of tangent screws. The rods are tested and rod corrections are applied to the elevations read.

Much leveling has been done in addition to that published in the following lists of elevations, especially in the mountainous regions, for which it is thought inadvisable to publish elevations at this time on account of the many lines which were left unchecked at the end of last field season and also on account of excessive errors of closure in a few circuits which will in most cases be checked by rerunning to bring them within reasonable limits.

The least square adjustment of the precise level net made by the United States Coast and Geodetic Survey in 1900 which has served as a basis for most of the elevations and corrections published heretofore, and also for elevations used until 1903, has been superseded by an adjustment made in the spring of 1903 by that bureau of a larger net comprising many more lines of precise leveling.

This 1903 adjustment of the precise level net is adopted as a basis for the elevations of the following list which are on lines affected, and is considered to be the most reliable source of reference to mean sea level for the various local level lines which may touch upon it, until the re-running of further precise levels may show a revision to be necessary.

PRECISE LEVELING.

FRANKLIN COUNTY.

The elevations published in the following list are the result of a line of precise leveling ran north from Tupper Lake to a connection with a primary bench mark of the Deep Waterway Commission at Fort Covington, Franklin county, a 2-inch square cut on east abutment of the Grand Trunk railroad bridge over Salmon river, 1 foot from the south edge and 1 foot from the east edge. The elevation of this is accepted as 166.452 feet above mean sea level as derived by the United States Coast and Geodetic Survey adjustment of 1903 of the precise level net.

The results here listed are not adjusted for closure error and give a new value for the Tupper Lake junction bench mark as here published, 0.174 greater than the previously published elevation of same. This bench mark is an aluminum tablet set in foundation of water tank of the New York Central railroad, Adirondack division, marked "1555 ALBANY."

The leveling was executed by Mr. C. H. Semper, levelman in charge, under the immediate supervision of Mr. H. M. Wilson, geographer.

All bench marks are referred to the Grist-Mill bench mark at Greenbush near Albany, the elevation of which is accepted as 13.863 feet above mean sea level, and are marked with the letters "ALBANY," in addition to their figures of elevation and year.

Tupper Lake Junction, via Moira and Bombay, to Fort Covington.

	Feet.
Tupper Lake Junction, New York Central Railroad, Adirondack Division; in foundation to water tank; aluminum tablet marked "1555 ALBANY"	1,556.031
Kildare, 350 feet north of station; in large bowlder 8 feet east of rail; bronze tablet marked "1528 ALBANY 1900"	1,527.874
Blue Pond, 5 miles north of; 1,300 feet north of milepost "T. 18 & O. 110," in large bowlder 10 feet west of track; bronze tablet marked "1551 ALBANY 1900"	1,551.259
Brandon, 1 mile north of; .4 mile north of milepost "T. 23 & O. 105," in large bowlder 10 feet west of track; bronze tablet marked "1595 ALBANY 1900"	1,594.129
Leboeuf, .3 mile north of; 125 feet north of section post 14-15, and 50 feet east of railroad; in large rock; bronze tablet marked "1556 ALBANY 1900"	1,555.690
Santa Clara, .7 mile north of; 750 feet north of milepost "T. 37 & O. 91" in large rock 10 feet east of railroad; bronze tablet marked "1306 ALBANY 1900"	1,306.086
St. Regis Falls, 1,000 feet south of station; in large rock 20 feet west of railroad and 300 feet north of railroad water tank; aluminum tablet marked "1256 ALBANY 1900"	1,256.497
Dickinson Center, 3.6 miles north of; on east side of railroad at culvert No. 18, 25 feet east of rail; 5 feet north of track; in large rock; aluminum tablet marked "603 ALBANY 1900"	602.642
Moira, Methodist Episcopal church, in east face of; aluminum tablet marked "420 ALBANY 1900"	419.450
Bombay, public school on Main street; in northwest face of; bronze tablet marked "193 ALBANY 1900"	193.144
Fort Covington (deep waterway primary bench mark), Grand Trunk Railroad bridge over Salmon River, 2 inches square; 1 foot from south edge and 1 foot from east edge of east abutment of	166.453
Fort Covington, Grand Trunk Railroad bridge over Salmon River; 600 feet west of station; top of south end of east abutment; bronze tablet marked "167 ALBANY 1900"	166.452

ALBANY, SARATOGA AND WARREN COUNTIES.

Schenectady No. 207, Saratoga No. 206, Luzerne No. 205 and North Creek No. 204 Quadrangles.

The elevations published in the following list are the result of a line of precise levels run from United States Engineers' bench mark in Schenectady to better determine the elevation for a bench mark at North Creek, upon which the leveling in that vicinity was originally based. This list is republished with a correction of 0.427 foot added to the elevations previously reported. This corrected list accords with the 1903 adjustment of the precise level net and is based upon the "Gristmill" bench mark at Greenbush near Albany, the elevation of which is now accepted as 13.863 feet above mean sea level.

The leveling was done by Mr. E. L. McNair, and all bench marks set in the course of this work are marked with the letters "ALBANY 1899" in addition to the figures of elevation.

Schenectady via Delaware and Hudson Railroad to North Creek.

	Feet.
Schenectady, New York Central and Hudson River Railroad bridge over Erie Canal, northeast corner of; coping stone of abutment; bronze tablet marked "242 ALBANY 1899." Set in August, 1898..........	241.195
Ballston Lake, .75 mile north of; coping stone at west end of stone culvert under railroad; aluminum tablet marked "269 ALBANY 1899"	269.116
Ballston, Saratoga county court house; foundation stone 4 feet left of main entrance to; aluminum tablet marked "320 ALBANY"........	320.848
Saratoga, Delaware and Hudson Railroad station; 1500 feet south of; at east end of north abutment of steel girder bridge over Congress street; coping stone; aluminum tablet marked "314 ALBANY 1899".	314.410
Greenfield station, .33 mile north of; at southeast corner of stone culvert under railroad; in coping stone; aluminum tablet marked "596 ALBANY 1899"	596.343
Kings station, .8 mile north of; at northeast corner of stone culvert under railroad; in coping stone; aluminum tablet marked "602 ALBANY 1899"	602.834
Hadley, 1.5 miles south of; at northeast corner of stone culvert about 600 feet west of red house on west side of highway; in coping stone; aluminum tablet marked "634 ALBANY 1899"....................	634.309
Hadley, 3.5 miles north of; at northeast corner of steel girder-bridge No. 9 over Wolf creek; coping stone of bridge seat; aluminum tablet marked "630 ALBANY 1899".................................	630.458
Stony Creek, .4 mile south of; at northwest corner of steel girder bridge No. 10 over Stony creek; on coping stone of bridge seat; aluminum tablet marked "600 ALBANY 1899"...........................	600.427
Thurman, 1.25 miles north of; at west end of south abutment of steel girder bridge No. 13; coping stone; aluminum tablet marked "628 ALBANY 1899"	628.264

	Feet.
The Glen, Delaware and Hudson river station; 530 feet north of; at southwest corner of steel-girder bridge, No. 14; 5 feet west of girder; coping stone of bridge seat; aluminum tablet marked "749 ALBANY 1899"	749.510
Riverside, 230 feet north of station door; 65 feet west of center of main track in large, flat rock outcrop 25 feet west of road; aluminum tablet marked "883 ALBANY 1899"	883.643
North Creek station, .4 mile southeast of; at southeast corner of steel girder bridge No. 18, 4.4 feet below east rail; bridge seat; aluminum tablet marked "1001 ALBANY 1899"	1,001.491
North Creek station, 1000 feet north of; in quarry outcrop on southwest side of track; 2 feet above track and 6 feet from southwest rail; bronze tablet marked "1012" (Note: This tablet set in 1896, the published elevation of same being 1007.185.)	1,008.048

Oneida, Lewis and Jefferson Counties.

Remsen No. 127, Port Leyden No. 113, Lowville No. 101, Carthage No. 100, Great Bend No. 99, Theresa No. 88, Watertown No. 89 and Clayton No. 78 Quadrangles.

The elevations published in the following list are based upon the "Gristmill" bench mark at Greenbush near Albany, the accepted elevation of which is 13.863 feet above mean sea level. The initial point upon which these levels depend is a bronze tablet set in the coping at the north end of retaining wall between the lower mill dam and Rome, Watertown and Ogdensburg railroad, at Remsen, N. Y., marked "1172." The elevation of this bench mark is derived by a readjustment of primary circuits, starting from a bench mark of the precise level net at Utica, recovered by the army engineers' precise leveling in 1902. As a result of this readjustment, the elevation of the Remsen bench mark is accepted as 1,171.464 feet above mean sea level.

A closure was made at Limerick on a temporary bench mark on the south parapet wall of stone arch bridge over Perch river. This bench mark is on a primary circuit tied at Clayton to bench mark "A" of the precise line of the Deep Waterway Board, being a copper bolt in the water table at the southwest corner of the Catholic church. The elevation of the latter as corrected by the 1903 adjustment by the United States Coast and Geodetic Survey is accepted as 278.815 feet above mean sea level.

The elevation of the Limerick bench mark as determined by the primary circuit is 317.06 feet, and as carried by the precise line from Remsen is 817.09 feet above mean sea level. The latter elevation is accepted for this bench mark, the closure 0.03 foot being well within the closure error of the primary circuit. The list, therefore, as here presented is the unadjusted mean result of double-rodded simultaneous precise leveling.

The leveling was done by Mr. C. H. Semper, levelman in charge, during the months of August and September, 1900.

All permanent bench marks dependent on this datum are marked with the letters "ALBANY" in addition to their figures of elevation and the year. The elevations marked are mostly 1 foot low, an error caused by using in field work an erroneous elevation for the Remsen bench mark, clerical error of 1 foot in previous publication.

	Feet.
Remsen, between lower mill dam and R. W. & O. R. R., north end of retaining wall; in end of coping, in face near corner; bronze tablet marked "1172"	1,171.464
Alder Creek, milk station, 100 feet south of railroad station; west side of railroad, in south end, east face of wall; bronze tablet marked "1253 ALBANY 1900"	1,254.385
Boonville, Canal lock No. 71, at railroad station; west wall; south end, top of; bronze tablet marked "1120 ALBANY 1900"	1,121.306
Port Leyden, Hotel Brunswick, opposite station; front face in brick work; bronze tablet, marked "897 ALBANY 1900"	898.400
Glenfield, railroad station; front face of; bronze tablet marked "776 ALBANY 1900"	777.639
Lowville station, 1000 feet south of; railroad bridge No. 1, 756 over creek and highway, north abutment, west side; bronze tablet marked "863 ALBANY 1900"	864.512
Castorland, station, 1200 feet south of; bridge over creek; top of north abutment, west side; bronze tablet marked "736 ALBANY 1900"	737.761
Carthage, iron highway bridge over Black river; end of bridge rail 10 feet west of railroad, on east end top of wing wall; bronze tablet marked "741 ALBANY 1900"	742.143
Felts Mills, Island Bridge; south abutment of bridge over north channel of Black river on east end of bridge seat of; bronze tablet marked "583 CAPE VINCENT"	582.456

ALBANY, SCHENECTADY, SCHOHARIE, OTSEGO, BROOME, TIOGA, CHEMUNG, STEUBEN, ALLEGANY AND CATTARAUGUS COUNTIES.

Cohoes No. 225, Schenectady No. 207, Amsterdam No. 189, Schoharie No. 174, Decatur No. 159, Cooperstown No. 144, Oneonta No. 131, Unadilla No. 118, Nineveh No. 107, Binghamton No. 96, Apalachin No. 86, Owego No. 76, Chemung No. 67, Elmira No. 61, Corning No. 55, Cameron No. 49, Hornellsville No. 43, Wellsville No. 38, Belmont No. 181, Olean, No. 26, Salem No. 242, Salamanca No. 20, Gowanda No. 13, Cherry Creek No. 7 and Dunkirk No. 3 Quadrangles.

The elevations in the following list are the result of a line of precise levels run between Dunkirk and Binghamton over the line of the Erie railway and between Binghamton and Cohoes over the line of the Delaware and Hudson Canal Company's railway. Between Dunkirk and Elmira the line was carried eastward based on the top of the water table of Nelson Block, Dunkirk, and all bench marks in this portion of the line are marked with the legend "D 1898," in addition to their figures of elevation, thus referring them to the Dunkirk datum. The section between Cohoes and Elmira was run westward based on the old "Grist Mill" bench mark near Albany, and are marked with the legend "A 1898" in addition to the figures of elevation, thus referring them to the Albany datum.

The elevation of the initial bench mark at Dunkirk was originally based on a datum furnished by the United States Engineers in 1897 as obtained through their old line of wye levels from the "Grist Mill" bench mark to Oswego and thence by water levels on Lakes Ontario and Erie via Erie, Pa., to Dunkirk. This was corrected to mean sea level datum by substracting 1.085 feet from the elevation given by the Engineers based upon mean low water at Albany, resulting in the height 587.805 feet originally accepted for this bench mark in the fieldwork.

The usual double rodded simultaneous direct and reverse method was used and the same Buff and Berger precise level previously used, but the rods used were targeted on one side and self reading on the other. The result by the targeted line in each section was used alone as the original unadjusted line that face having been tested, the line employing the self reading faces being used as a check.

The closure at Elmira between the two lines was 0.645 foot but there is a greater difference between the datum of figures marked on the bench marks on account of an error of 1 foot in the elevation started with in the east section.

The differences of elevation between the various bench marks as shown by the duplicate rodded lines, was very small. The final divergence being —.196 foot for the direct line going eastward and —.224 foot for the direct line going westward, making total closure of the targeted upon the self reading rod lines +.028 foot at Schenectady. This divergence is far within the limit set for precise leveling.

This line of levels now forms 6 elementary lines in the precise level net as adjusted in 1903 by the United States Coast and Geodetic Survey which supersedes the former adjustment of 1900 in which it formed but one link. From Dunkirk eastward the six main junctions with the other level lines are at Salamanca, Hornellsville, Elmira, Binghamton, Bainbridge and Rexford Feeder Bridge, Schenectady.

The corrected elevations for the Nelson Block bench mark is now accepted as 588.866 feet above mean sea level. The unadjusted line raised to accord with the latter has been corrected by the 1903 adjustment at the other junctions aforesaid respectively by the following amounts: +0.250, +0.286, +0.236, +0.232, +0.161, and —0.005; the corresponding distances from Dunkirk being 44.1, 129.3, 187.7, 246.3, 283.6 and 381.8 miles. The algebraic difference between consecutive figures of the first or second lines is the amount distributed or the distance between those points respectively.

The leveling was done by Mr. E. L. McNair (now topographer) in the field season of 1898.

Erie Railroad, Dunkirk to Elmira.

	Feet.
Dunkirk, St. Mary's Home and School, Washington avenue, between Third and Fourth streets; in water table 20 feet from northeast corner; aluminum tablet marked "598-DUNKIRK-1899"...........	598.936
Forestville, 530 feet west of entrance in waiting room of Erie station; in bridge seat at northeast corner of iron bridge over highway; 7 feet north of center of track; bronze tablet marked "871 D"...........	871.888
Smiths Mills, 2.3 miles east of; 10½ feet north of center of railway track in foundation stone under west end of overhead highway bridge; bronze tablet marked "1097 D, 1898"............................	1,098.628

	Feet.
Perrysburg, Erie station at; 400 feet east of waiting room, in keystone at north end of stone arch culvert under railway; bronze tablet marked "1261 D"	1,262.417
Dayton, Erie station at; 950 feet north of; 37½ feet east of center of track; coping of tunnel underneath Erie track; second stepstone from top; bronze tablet marked "1322 D"	1,322.926
Cattaraugus, Union school building at; in water table at right of main entrance to; bronze tablet marked "1401 D"	1,385.631
Little Valley, Cattaraugus County court-house at; foundation wall at southwest corner of; aluminum tablet marked "1593 D"	1,594.244
Salamanca, 3¼ miles west of; bridge seat of iron girder bridge, southwest corner of; bronze tablet marked "1413 D"	1,413.771
Salamanca, Union school building on Maple street at; in water table at right of main entrance; aluminum tablet marked "1391 DUNKIRK, 1899"	1,391.485
Carrolton, 475 feet east of Erie station at; west pier of Buffalo, Rochester and Pittsburg Railway iron bridge crossing over Erie tracks; bronze tablet marked "1393 D"	1,394.641
Allegany, 1.8 miles west of Erie station; stone arch culvert under Erie Railroad, 75 feet east of road crossing, south end of; next to top step; bronze tablet marked "1408 D". (Originally set in 1897 and marked "1415 S")	1,408.938
Olean, city hall and post-office building on State street at; northwest corner of; stone next under water table; bronze tablet marked "1450 D". (Originally set in 1896 and marked "1457")	1,451.790
Hinsdale, 2¼ miles east of; bridge seat of small girder bridge, 9½ feet northwest of center of track; bronze tablet marked "1508 D"	1,509.288
Cuba, ½ mile east of Erie station at; south end of pier of stone arch bridge over Union street; aluminum tablet maked "1515 D" (Originally a bronze tablet set in 1896 and marked "1522")	1,516.789
Friendship, Union School building at; water table at right of main entrance; aluminum tablet marked "1520 D"	1,521.036
Belvidere, ⅝ mile east of; south end of wing wall of abutment at east end of railway bridge over Van Campen Creek; 28 feet south of center of track; bronze tablet marked "1351 D"	1,352.243
Belmont; southeast corner of Allegany county jail; in stone foundation; aluminum tablet marked "1416 D"	1,417.765
Wellsville, Union School building at; northeast corner entrance; in footstone of arch over entrance; aluminum tablet marked "1519 D"	1,520.514
Andover, 3 miles west of; iron girder, railroad bridge No. 8, stone step of; bronze tablet marked "1573 D"	1,574.208
Andover, 2 miles east of; stone foundation at southeast corner of small railway bridge; bronze tablet marked "1675 D"	1,676.105
Alfred; Erie station; water table under front office window, facing track; aluminum tablet marked "1610 D"	1,611.391
Almond; 950 feet east of Erie station; bridge foundation at northwest corner of small railroad bridge over highway; aluminum tablet marked "1383 D"	1,382.914
Hornellsville; 0.7 mile east of Erie station; foundation wall at northeast corner of iron railroad bridge; aluminum tablet marked "1141 D"	1,142.481
Canisteo, 2.1 miles east of; bridge seat of iron girder bridge No. 87, northeast corner of; aluminum tablet marked "1113 D"	1,114.092
Adrian, 3.7 miles east of; in face of rock cliff on east side of Erie Railroad and highway, 400 feet northeast of highway across Canisteo river, 25 feet from east rail; bronze tablet marked "1080 D"	1,081.183

	Feet.
Cameron, 180 feet west of Erie station at; in stone foundation of railroad water tank; bronze tablet marked "1048 D"	1,048.915
Rathbone, general merchandise store of F. G. Martin (building owned by O. O. Whittemore); foundation stone at right of main entrance; bronze tablet marked "1006 D"	1,007.041
Addison; 0.4 mile east of Erie station and 750 feet northwest of tracks; Union School building at right of main entrance to; aluminum tablet marked "1021 D"	1,022.554
Painted Post, 0.8 mile west of; in masonry wall of open culvert, east wall of culvert and south side of railroad track; bronze tablet marked "935 D"	936.195
Corning; city hall at corner of Erie avenue and Cedar street; foundation stone under water table at right of Cedar street entrance; aluminum tablet marked "935 D"	936.759
Big Flats, 1¼ miles west of; in bridge seat at Erie Railroad bridge No. 67A, at southwest corner of; bronze tablet marked "899 D"	900.815
Horseheads; 0.35 miles southwest of Erie station; on pier of Lackawanna railroad bridge at crossing of Northern Central Railway, 50 feet south of center of north-bound track of Northern Central Railway; aluminum tablet marked "901 D"	902.111
Horseheads; Northern Central Railway station; northeast corner of stone doorsill of men's waiting room	900.113
Elmira; city hall, corner of Church and Lake streets; stone pedestal of lamp-post at left of Lake-street entrance; aluminum tablet marked "857 ALBANY"	858.626

Delaware and Hudson Canal Company's Railroad, Elmira to Binghamton.

Elmira, ½ mile east of Erie station at; + chisel mark on head of iron bolt set in stone foundation at west end of Erie railroad bridge across Chemung river. Bolt in between tracks and nearest eastbound track.	854.593
Wellsburg station, 1,800 feet west of; coping stone of abutment wall at southeast corner of bridge No. 55; aluminum tablet marked "824 A".	823.204
Chemung station, 1 mile west of; coping stone of abutment wall at northeast corner of bridge No. 53 across Chemung river; aluminum tablet marked "804 A"	803.077
Waverly, city hall building on Broad street; stone column between doorways; aluminum tablet marked "840 A"	839.336
Barton, 1.2 miles east of; coping stone of abutment at southeast corner of bridge No. 40; aluminum tablet marked "798 A"	797.517
Owego, 2¼ miles west of Erie station at; coping stone of abutment at southeast corner of bridge No. 37; aluminum tablet marked "815 A".	815.028
Owego, 2¾ miles east of Erie station at; coping stone at northwest corner of bridge No. 33; aluminum tablet marked "812 A"	811.679
Union, 1.4 miles west of; coping stone of wing wall of abutment at northeast corner of bridge No. 31, across Nanticoke creek; bronze tablet marked "825 A"	828.353
Binghamton, Broome county court-house, west end of; at left of basement; entrance from Collier street; aluminum tablet marked "867 A"	866.056
Port Crane station, 3¼ miles west of; 900 feet west of road crossing; parapet wall at east end of culvert under railway; bronze tablet marked "959 A"	958.519
Sanataria Springs station, ½ mile east of; coping stone of abutment at northeast corner of brdge No. 107 over highway; bronze tablet marked "1126 A"	1,125.617

	Feet.
Tunnel station, ½ mile west of; coping stone of abutment at southeast corner of bridge No. 104, crossing over road; bronze tablet marked "1384 A"	1,384.002
Harpersville station, 1,250 feet west of; coping stone of abutment at southwest corner of iron trestle bridge No. 97; bronze tablet marked "1051 A"	1,049.041
Afton station, 1,050 feet east of; coping stone of abutment at northeast corner of iron girder bridge No. 90¼, crossing over highway; bronze tablet marked "973 A"	972.782
Bainbridge, 2 miles west of; foundation stone at northeast corner of small cattle pass opening; bronze tablet marked "978 A"	977.676
Bainbridge, 2¾ miles east of; coping stone of bridge abutment at southeast corner of bridge No. 84; bronze tablet marked "989 A"	989.674
Unadilla, Union school building at; foundation wall at left of main entrance to; aluminum tablet marked "1024 A"	1,023.325
Wells Bridge, Delaware and Hudson station at; about 300 feet west of; coping stone of abutment at northeast corner of highway bridge across Susquehanna river; bronze tablet marked "1047 A"	1,046.657
Otego, 1 mile east of; southeast corner of culvert, third step from top; bronze tablet marked "1051 A"	1,050.145
Oneonta State Normal School; in face of west pillar at main entrance of; aluminum tablet marked "1232 A"	1,231.912
Oneonta, Delaware and Hudson station; southwest corner of doorsill of door into waiting room and dining hall; door faces track and is east of office window	1,086.469
Colliers, 700 feet east of; bridge No. 54, across Susquehanna river; northeast corner of coping stone of east abutment; bronze tablet marked "1119 A"	1,118.493
Maryland, 1.9 miles west of; southeast corner of bridge No. 51 across Schenevus creek; parapet wall; bronze tablet marked "1170 A"	1,169.850
Schenevus, Delaware and Hudson station, ¼ mile east of; coping stone of abutment at southeast corner of bridge across Schenevus creek; bronze tablet marked "1272 A"	1,271.387
Worcester, Delaware and Hudson station; 80 feet west of west end of; railroad water tank foundation; third course of stone east side of bank; aluminum tablet marked "1311 A"	1,310.160
East Worcester, ¾ mile west of; center pier of railroad bridge over large culvert; capstone at north end; aluminum tablet marked "1406 A"	1,405.207
Richmondville, 0.6 mile west of; Delaware and Hudson Railroad bridge No. 31; coping stone of east abutment wall at northeast corner of bridge; bronze tablet marked "1224 A"	1,223.062
Cobleskill Union school building, stone foundation at northwest corner of; bronze tablet marked "930 A"	929.604
Howes Cave, 1.2 miles east of; bridge seat at northwest corner of small bridge over open culvert; bronze tablet marked "731 A"	730.725
Esperance; Delaware and Hudson station, 1,250 feet west of; coping stone at north end of stone culvert under Delaware and Hudson Railroad; bronze tablet marked "753 A"	752.440
Duanesburg, Delaware and Hudson station, 1,000 feet west of; north end of east abutment; bronze tablet marked "681 A"	680.822
Kelleys, 1¾ miles east of; coping stone at east abutment of cattle and wagon pass, 750 feet east of highway; bronze tablet marked "410 A"	409.008
Schenectady, New York Central and Hudson River Railroad bridge over Erie Canal; northeast corner of coping stone of abutment wall; bronze tablet marked "242 A"	241.195

BROOME, DELAWARE, SULLIVAN, ORANGE AND ULSTER COUNTIES, N. Y.

Binghamton No. 96, Nineveh No. 107, Newburg No. 194 and Poughkeepsie No. 212 Quadrangles.

The elevations in the following lists are referred to the "Grist Mill" benchmark near Albany, the elevation of which is now accepted as 13.863 feet above mean sea level. The two sections of this line, Binghamton to Hancock, and Hancock to Poughkeepsie, form two links in the net of precise leveling in the United States. The lengths of these sections are 49 and 138 miles, respectively. The elevations here reported are the result of the 1903 adjustment of that net. The effect of this adjustment upon the original results by this line has been to increase the elevation at Hancock with respect to Binghamton 0.042 foot, and increase the elevation at Poughkeepsie with respect to Hancock 0.423 foot.

The leveling was done during June, July and August, 1900, under the direction of Mr. H. M. Wilson, geographer, by Mr. C. H. Semper, levelman.

All permanent benchmarks dependent on this datum are marked with the letters "ALBANY" in addition to the figures of elevation.

	Feet.
Binghamton, Broome county court house; west end of, at left of basement entrance from Collier street; aluminum tablet marked "867 A".	866.056
Langdon, 1,000 feet north of station; top of south abutment west side of creek culvert; bronze tablet marked "860 ALBANY 1900"......	860.468
Deposit, 1 mile west of; iron bridge over river; south wing of east abutment; bronze tablet marked "1026 ALBANY 1900"...............	1,026.543
Deposit, 4.4 miles south of; north abutment of iron bridge west side, top of bridge seat; bronze tablet marked "978 ALBANY 1900"......	978.972
Hancock along Erie Railroad to Middletown.	
Hancock, .7 mile northwest of; large steel bridge, on top of parapet wall; 6 feet east of rail; bronze tablet marked "924 ALBANY 1900"	924.721
Stockport, 1.1 mile south of; bridge No. 17, west abutment, south side, on top of second step; bronze tablet marked "882 ALBANY 1900"..	882.904
Lordville, at railroad station; suspension bridge over Delaware river, in face of north abutment; bronze tablet marked "865 ALBANY 1900"...	865.915
Long Eddy, 400 feet north of station; girder bridge; south abutment, east side of, in top of bridge seat; bronze tablet marked "834 ALBANY 1900"..	835.195
Hankins, 1 mile south of; 100 feet west of milepost "J. C. 141" south side of railroad, in west abutment of small bridge over creek; aluminum tablet marked "801 ALBANY 1900"....................	802.015

	Feet.
Callicoon, 900 feet south of station; railroad girder bridge over Delaware river, top of north abutment; east side; bronze tablet marked "780 ALBANY 1900"	780.683
Cochecton, 100 feet north of station; railroad bridge over highway, top of north abutment, east side; bronze tablet marked "746 ALBANY 1900"	746.777
Narrowsburg, 600 feet west of station, rock cut; 100 feet west of east end of cut, on north side; bronze tablet marked "718 ALBANY 1900"	718.717
Port Jervis, Erie railroad bridge over East Main street; top of south abutment, west side, first step below bridge seat; bronze tablet marked "456 ALBANY 1900"	457.077
Guymard, 600 feet north of station; railroad culvert, north abutment, west side, top of; bronze tablet marked "780 ALBANY 1900"	780.914
Otisville, 500 feet west of station; small railroad bridge over private road, west abutment, north side, top of bridge seat; bronze tablet marked "861 ALBANY 1900"	862.219
Middletown, Clemson Bros., saw shop; in front face of, left of office entrance, in brick work; bronze tablet marked "558 ALBANY 1900"	558.919
Campbell Hall, Campbell Hall Hotel; south face of, in brick work; bronze tablet marked "408 ALBANY 1900"	409.078
Campbell Hall north along Wallkill Valley Railroad to Walden, thence to East Walden and along Central New England Railroad to Poughkeepsie.	
Walden National Bank; in southwest corner of; aluminum tablet marked "376"	375.136
Lloyd, Centerville Hotel; southeast corner of; bronze tablet marked "359"	358.177
Poughkeepsie, corner of Main and Washington streets, in front face of City Hall; aluminum tablet marked "173 A"	172.991

ONEIDA, MADISON, CHENANGO, OTSEGO, AND DELAWARE COUNTIES.

Utica No. 128, Oriskany No. 115, Bridgewater No. 129, New Berlin No. 117, Unadilla No. 118, Otego No. 131, Walton No. 132, Deposit No. 119 and Hancock No. 133 Quadrangles.

The elevations in the following list are the result of a line of precise leveling based upon the "Grist Mill" benchmark near Albany, the elevation of which is now accepted as 13.863 feet above mean sea level. A small circuit was first run in Utica recovering various benchmarks of other level lines and closed with an error of 0.01 foot in a total distance of 2.7 miles of double rodded direct and reverse simultaneous lines. The main line runs south from lock No. 46 to a connection first near Sidney, or 2.7 miles east of Bainbridge, with the precise level line run in 1899 by Mr. E. L. McNair, topographer, the results of which appear in another list as republished from a previous report corrected by the 1903 adjustment.

Continuing thence south a final connection was made 0.7 mile north of Hancock to the precise level line ran in 1900 by Mr. C. H. Semper, levelman, the results of which appear in this report. Thus are formed two elementary lines of the precise level net, 63.6 miles and 43.9 miles, respectively, with a total divergence in each section of only 0.02 foot between the direct and reverse simultaneous lines, though the maximum local divergence amounted to 0.04 foot in a stretch of 5 miles and 0.05 foot in another of 7 miles.

The adjustment of the precise level net made in the spring of 1903 by the U. S. Coast and Geodetic Survey in which these lines became factors, resulted in increasing the elevation by the unadjusted line 0.119 foot at Sidney with respect to Utica, and 0.078 foot at Hancock with respect to Sidney. The results here listed are derived by applying interpolated corrections to the original results proportional to the distance, and accord with the 1903 adjustment.

The party outfit was similar to, and the methods of the leveling the same as that in previous use.

The leveling was done during part of July, August and September, 1901, by Mr. D. H. Baldwin, topographer in charge.

All permanent benchmarks dependent on this datum are marked with the letters " ALBANY " in addition to the figures of elevation and the year.

Utica.

	Feet.
Deep Waterway bench mark; copper nail in root of elm tree about 50 feet north of north bank of Mohawk river; and about 830 feet northeast from northeast corner of railroad bridge over Mohawk river and Black river branch of the New York Central and Hudson River Railroad	405.083
Post office, west side of east of two rear entrances in basement area on building wall; bronze tablet marked "419 feet"	417.207
Whitesboro street bridge (State Engineer's B. M. No. 222) southwest corner of stone platform, base of west stairs; towpath abutment; 3 feet below towpath; copper bolt	431.637
Lock No. 46 (State Engineer's B. M. No. 223), northeast hollow quoin; towpath lock, between anchors; copper bolt	430.410

Utica south along Delaware, Lackawanna and Western, Unadilla Valley, and New York, Ontario and Western Railroads to Sidney.

Washington Mills; .5 mile east of; bridge No. 76, southeast corner of; northeast corner of stone under bed plate; aluminum tablet marked "633 ALBANY 1901"	633.384
(Reported in 1902 as possibly removed during reconstruction work.)	

	Feet.
Richfield junction, .36 mile south of; on south end of foundation wall of wooden trestle bent under overhead highway bridge; west side of track; aluminum tablet marked "1221 ALBANY 1901"	1,221.512
Line continued south along Unadilla Valley Railroad.	
Leonardsville; at southeast corner of milk station; in face of corner stone of foundation; aluminum tablet marked "1152 ALBANY 1901"	1,152.551
South Edmeston, .2 mile east of railroad; at northeast corner of highway bridge on top stone of foundation; aluminum tablet marked "1110 ALBANY 1901"	1,109.984
New Berlin, New York, Ontario and Western railway bridge, No. 52; near northwest end of center pier; on top of coping stone; aluminum tablet marked "1089 ALBANY 1901"	1,089.291
Line continued southwest along New York, Ontario and Western Railway.	
South New Berlin, Baptist church, under front window; north side of entrance near northwest corner of building; in 3d course of brick above water table; aluminum tablet marked "1059 ALBANY 1901"	1,059.667
Mt. Upton, Methodist church, east side of; north side of front entrance; in third course of foundation stone above ground; aluminum tablet marked "1035 ALBANY 1901"	1,035.710
South along main line of N. Y., O. & W. R. R. to Sidney, thence west to Bainbridge, 2.7 miles east of.	
Bainbridge, 2.7 miles east of; coping stone at southwest corner of bridge No. 84; bronze tablet marked "989 ALBANY 1901"	989.674
Sidney along N. Y., O. & W. R. R., southwest to Walton, thence southwest to Hancock.	
Maywood (Sidney Center); trestle No. 216, under north side of third trestle tower from east end; in top of old pier; aluminum tablet marked "1344 ALBANY 1901"	1,344.405
Northfield, .37 mile northwest of; at south end of zigzag tunnel; 30 feet south of south end of; vertical face of rock on west side of track about 6 feet above rail; aluminum tablet marked "1766 ALBANY 1901"	1,766.900
Walton, southwest corner of North and Gardiner streets; at northwest corner of Ogden Free Library in east face of corner stone of water table; aluminum tablet marked "1215 ALBANY 1901"	1,216.051
Rock Rift, .5 mile north of; 150 feet south of crossing, on east side of track; 4 feet above rail, on face of ledge; aluminum tablet marked "1214 ALBANY 1901"	1,214.760
Cadosia, .17 miles west of; at west abutment of trestle No. "B 1", on south corner coping stone of; parapet wall; aluminum tablet marked "990 ALBANY 1901"	900.572
(From this point via Main street down hill to Erie station, thence northwest to tablet.)	
Hancock, .75 miles north of; large steel bridge No. 19, southeast corner of; on top of parapet wall; 6 feet east of rail; bronze tablet marked "924 ALBANY 1900"	924.721

CHEMUNG COUNTY.

Elmira No. 61 Quadrangle.

The elevations in the following list are the result of a line of precise leveling ran south from Elmira, a point on the precise level line of 1898 and connected at Williamsport, Pa., to a circuit of Pennsylvania railroad levels from Harrisburg. The latter point is on the United States Coast and Geodetic Survey transcontinental precise line. This line was involved as a factor in the 1903 adjustment of the precise level net and the result of this is to lower the elevation by the original line only 0.004 foot at Williamsport with respect to Elmira. The length of this line is 75 miles.

The usual method of leveling and party outfit was used.

The leveling was done in 1899 by Mr. C. H. Semper, levelman in charge.

The bench marks on this line are marked with the letters "HARRISBURG" in addition to figures of elevation and the year 1899.

The elevations marked are mostly 1 foot low due to an error of about 0.7 foot in the originally accepted elevation at Elmira, and thus do not all accord with the reference mark at Harrisburg, an aluminum tablet marked "364 HARRISBURG 1899," in the State library, the elevation of which is accepted as 363.988 feet above mean sea level.

Elmira south along Northern Central Railroad to Williamsport.

	Feet.
Elmira, City Hall, corner of Church and Lake streets; stone pedestal of lamp post; aluminum tablet marked "857 ALBANY 1898"......	858.626
Elmira, 7 miles south of; creek and cattle pass culvert; west side of railroad, in wall; bronze tablet marked "1067 HARRISBURG 1899".	1,068.338

MONROE, LIVINGSTON, ALLEGANY AND STEUBEN COUNTIES.

Rochester No. 40, Honeoye No. 41, Caledonia No. 35, Mt. Morris No. 36, Canaseraga No. 37 and Hornellsville No. 43 Quadrangles.

The elevations in the following list are the result of a line of precise leveling based upon the Rochester datum connecting the Lake Survey gauge bench mark at Charlotte with the State

Engineer's level line of 1901 at Rochester, and continued south to a final connection at Hornellsville with the precise level line ran by Mr. E. L. McNair, topographer, in 1899.

This line forms an element in the precise level net and a factor in the 1903 adjustment of the same made by the United States Coast and Geodetic Survey. The amount of correction this line receives by this adjustment is 0.084 foot, in a total distance of 88.4 miles, the original elevation at Hornellsville by this line being lowered 0.084 foot with respect to Charlotte. The total divergence of the direct and reverse simultaneous rodded lines is 0.096 foot.

The party outfit was similar to, and the methods of leveling the same as that in previous use.

The leveling was done during part of September, 1901, and part of August and September, 1902, by Mr. D. H. Baldwin, topographer in charge.

All permanent bench marks dependent in this datum are marked with the letters "ROCHESTER" in addition to the figures of elevation and year.

Charlotte south along New York Central, Pennsylvania Railroad, Pittsburg, Shawmut and Northern, and Erie Railroads via Rochester and Nunda to Hornellsville.

	Feet.
Charlotte, .22 mile northeast of New York Central station; old lighthouse, upper side of water table; at south southeast angle; east of the south window	283.168
Line continued south on Pennsylvania Railroad.	
Scottsville, 800 feet north of station; south side of creek overflow dam, on top of stone pier; bronze tablet marked "537 ROCHESTER 1902"	535.447
Honeoye junction; bridge No. 34, Lehigh Valley Railroad; northeast corner of; near corner of foundation coping stone; chiseled square	553.584
Line continued along Erie Railroad to Avon, thence along Pennsylvania Railroad.	
Mt. Morris, 2,200 feet east of Delaware, Lackawanna and Western station; at northwest corner of railroad bridge on coping stone; aluminum tablet marked "575 ROCHESTER 1901"	574.084
Tuscarora, 1,100 feet south of; southeast corner of bridge, top of parapet wall; bronze tablet marked "773 ROCHESTER 1902"	773.302
Nunda, Fireman's Hall, front face; 1 foot from northwest corner, in water table; aluminum tablet marked "944 ROCHESTER 1902"	944.345
Line continued along Erie Railroad.	
Swains; 200 feet south of Erie railroad station; small Union church, northwest corner of; in foundation wall; aluminum tablet marked "1316 ROCHESTER 1902"	1,316.658

	Feet.
Canaseraga, Kingston Hotel, southwest corner of; in water table; aluminum tablet marked "1253 ROCHESTER 1902"	1,252.973
Arkport, Methodist Protestant church, southeast corner of; in foundation stone; aluminum tablet marked "1188 ROCHESTER 1902"	1,188.284
Hornellsville, .7 mile east of station; at northeast corner of railroad bridge on foundation wall; aluminum tablet marked "1141 D"	1,142.481

CATTARAUGUS COUNTY.

Salamanca No. 20 and Red House No. 14 Quadrangles.

The elevations in the following list are the result of two independent lines of precise leveling ran in opposite directions between Salamanca, N. Y., and Irvineton, Pa. The results of connected lines seemed to indicate that an excessive error occurred in this line as at first ran; thus occasioning a second running with a result, however, checking to 0.043 foot the original figures. The final mean results of this combined line were included in the 1903 adjustment of the precise level net as a factor. The result of this was to increase the elevation at Irvineton, Pa., by this line 0.128 foot with respect to Salamanca, therefore there has been distributed in the result here listed a correction of 0.128 foot in a total distance of 48.8 miles proportional to the mileage. Both lines were run by the same method and similar party outfit as in previous work. Each being a double-rodded simultaneous direct and reverse read line, employing special 10-foot double-faced targeted rods. The total divergence in the 1902 line was but 0.011 foot and the total correction 0.085 foot.

The leveling of 1899 was done by Mr. E. L. McNair, topographer, and that of 1902 by Mr. D. H. Baldwin, topographer.

The permanent bench marks are referred to the Dunkirk datum and are marked with the letters "DUNKIRK" in addition to the figures of elevation and year 1899.

Salamanca, N. Y., along the Pennsylvania Railroad to Irvineton, Pa.

	Feet.
Salamanca, Union High school building; Maple street, at right entrance; in water table; aluminum tablet marked "1391 DUNKIRK 1899"	1,391.485
Red House, .56 mile southwest of; southeast corner of bridge No. 126, on foundation coping stone; aluminum tablet marked "1340 DUNKIRK 1899"	1,340.904
Quaker Bridge, 1.03 miles southwest of; at northeast corner of steel trussbridge, on foundation coping stone; aluminum tablet marked "1316 DUNKIRK 1899"	1,317.298

ERIE AND CHAUTAUQUA COUNTIES.

Buffalo No. 11, Eden No. 12 and Silver Creek No. 6 Quadrangles.

The elevations in the following list are the result of a line of precise levels connecting government bench marks at Buffalo and Dunkirk, which were formerly established from Lake gauging. This line is an element in the precise level net and became a factor in the latest least square adjustment made by the United States Coast and Geodetic Survey in the spring of 1903. In accord with this adjustment there has been a correction of 0.217 foot distributed proportional to the distance throughout this line to the unadjusted results, raising the elevation at Dunkirk 0.217 foot with respect to Buffalo. The unadjusted results close low 0.034 foot at Dunkirk upon the latest unadjusted water levels from figures in part given by the War Department corrected to a common elevation at Buffalo. The water level correction was derived by comparisons made between Buffalo and Erie and between Erie and Dunkirk. The elevation at Dunkirk upon the old Army Engineers' datum was obtained from a local office several years ago and no new records were obtainable, but the relative heights of the Buffalo and Erie bench marks have been more correctly determined by addition of later gauge records.

The water leveling to the Dunkirk bench mark was not entered as a factor in the adjustment since its weight was in doubt, there has thus been 0.184 foot correction made to the water leveling between Buffalo and Dunkirk by the adjustment.

The party outfit was similar to and the methods of leveling the same, as that in previous use.

The total length of this double rodded line is 40.87 miles and the total divergence 0.101 foot.

The leveling was done during part of July and August, 1902, by Mr. D. H. Baldwin, topographer in charge.

All permanent bench marks dependent on this datum are marked with the letters "ROCHESTER" in addition to the figures of elevation and year.

Buffalo along Lake Shore and Michigan Southern Railroad to Dunkirk.

	Feet.
Buffalo (United States Engineers' bench mark, and State Canal bench mark number 553). South U. S. Pier Light House, upper surface of plinth, east angle marked by chiseling in stone so as to leave a rounded point	590.099
Buffalo, Lehigh Valley Railroad bench mark northwest corner of bridge over Ohio Slip in top of foundation stone; iron bolt	586.228
Buffalo, northwest of New York Central switch tower; 24 feet from old stone milepost, 10 feet west of track; top of rail driven vertically in ground	589.591

Line continued along Lake Shore and Michigan Southern Railroad.

Athol Springs, .91 mile south of; southeast corner of stone arch cluvert bridge, in south face of coping stone; bronze tablet marked "631 ROCHESTER 1902"	631.110
Derby, 1.29 miles north of; 200 feet east of Lake Shore and Michigan Southern track; southeast corner of highway bridge; crossing Pennsylvania railroad, in west face of concrete wing wall, 2 feet above ground; bronze tablet marked "724 ROCHESTER 1902"	723.807
Farnham, southeast corner of bridge number 220; in east face of parapet coping stone; bronze tablet marked "633 ROCHESTER 1902"	632.956
Dunkirk, St. Mary's Home and School, Washington avenue, between third and fourth streets; 20 feet from northeast corner; aluminum tablet marked "598 DUNKIRK 1899"	598.937

PRIMARY LEVELING.

NEW YORK (LONG ISLAND.)

QUEENS, NASSAU AND SUFFOLK COUNTIES.

Hempsted No. 234, Oyster Bay No. 233, Northport No. 248, Babylon No. 249, Setauket No. 250, Moriches No. 252 and Riverhead No. 253 Quadrangles.

The elevations in the following list are based upon the Army Engineers bench mark "+18.0555" cut on the face of the retaining wall of Long Dock, in the military post grounds at Willets Point. The elevation of this is accepted as 14.060 feet above mean sea level, as obtained from tidal gauge observations made by the Coast and Geodetic Survey and the United States Army Engineer Corps at Willets Point. The elevations listed on the Hempstead and Oyster Bay quadrangles are republished for completeness from previous report without correction. The leveling on the Hemstead and Oyster Bay quadrangles was done in 1897 under the direction of Mr. E. B. Clark, topographer, by Mr. Clark Brown, levelman; that on the Northport and Babylon quadrangles was done in 1901 under the direction of Mr. Glenn S. Smith, topographer, by Mr. C. H. Semper, levelman; that on the Setauket quadrangle, was done in 1902 under the direction of Mr. Geo. H. Guerdrum, topographer, by Mr. Alfred P. Meade, Jr.; and that on the Moriches and Riverhead quadrangles was done in 1903 under the direction of Mr. J. M. Whitman, topographer, by Mr. Geo. Seidel, levelman.

All permanent bench marks dependent on this datum are marked with the letters "WILLETS PT." in addition to the figures of elevation.

Willets Point via Bayside and Queens to Mineola.	Feet.
Willets Point, military post grounds; long dock, face of retaining wall under coal shed, marked "+18.0555" with chisel..................	14.060
Creedmore schoolhouse, northwest corner of Madison avenue and Pine street; 15 feet from south line of lot and 2 feet from front line, iron post marked "85 W.P."..	85.163
Mineola via Jericho to East Norwich.	
Jericho, opposite hotel; top of marble highway monument in triangle of roads	194.08
Jericho, Jericho pike at fork of roads to Oyster Bay and Syosset; retaining wall east of road, 15 feet from driveway to residence, bronze tablet marked "218 W.P."..................................	218.160
East Norwich via Rosyln to Bayside.	
Roslyn, west side of south front of upper basin on public fountain, bronze tablet marked "37 W.P."................................	27.452
Mineola via Garden City and Hempstead to Merrick.	
Mineola, in coping west end north pier of railroad water tank, bronze tablet marked "105 W.P."......................................	105.291
Merrick, southwest corner of railroad crossing about 15 feet from center of track, 5 feet west of line of street, 15 feet north of corner of store, iron post marked "19 W.P."............................	18.834
Merrick via Freeport and Rockville to Mineola.	
Rockville Center, northeast corner of Village avenue and Observer street, in stone water table of brick building north of door between pilaster and window, bronze tablet marked "26 W.P.".....................	26.378
Jericho northeast along highway and railroad to Huntington.	
Jericho; Jericho turnpike at fork of roads to Oyster Bay and Syosset; in retaining wall east of road, 15 feet from driveway to residence; bronze tablet marked "218 P"................................	218.160
Huntington, Central Presbyterian church on Main street, front face of northwest corner of; bronze tablet marked "52 Willets Pt. 1901"...	52.193
East Northport south along highway via Comack to Brentwood.	
East Northport, .2 miles south of station; at south corner of school house, in front face; bronze tablet marked "229 WILLETS PT. 1901"	229.433
Brentwood, Presbyterian church, 500 feet south of station; front face of southeast corner of; bronze tablet marked "87 WILLETS PT. 1901".	87.401

Deer Park south along highway to Babylon.

	Feet.
Deer Park; 800 feet south of road crossing; in front face of south corner of church; bronze tablet marked "72 WILLETS PT. 1901"	72.071
Babylon; M. E. church on Deer avenue; front face near North end of; bronze tablet marked "17 WILLETS PT. 1901"	16.677
Farmingdale, Catholic church on Cherry street; in front face of, east end; bronze tablet marked "74 WILLETS PT. 1901"	73.550

East Northport east along Long Island Railroad to Port Jefferson, thence along highway south to Holtsville, thence west to Brentwood.

Smithtown, southwest wing wall of big railroad bridge; cement pier, west end of bridge; bronze tablet marked "26 WILLETS"	25.740
Port Jefferson, railroad crossing; 6 feet north of track, west side of highway crossing, 25 feet east of freight station; iron post marked "192 WILLETS"	192.078
Holtsville, brick house, north face of; south of track, 150 feet east of Holtsville station; bronze tablet marked "104 WILLETS"	103.728
Ronkonkoma, east end of station; in grass plot; south of highway, north of track; iron post marked "108 WILLETS"	108.300

Selden along public road east via Middle Island to Riverhead southwest to Eastport, thence west along Long Island Railroad to Pachogue, thence north along road to Holtsville.

Middle Island post office, .4 mile east of west end of Artist Lake, 20 feet south of center of highway, 175 feet west of road to Woodville, in rock; bronze tablet marked "57 WILLETS PT."	57.065
Horn Tavern, 1.2 miles east of; south side of road, about 800 feet east of Henry Hallock's farm house, at road running south; iron post marked "83 WILLETS PT."	83.454
Riverhead, Court House; northeast corner of; in brick foundation; aluminum tablet marked "WILLETS PT."	27.862
Eastport, 225 feet north of railroad station; south side of road to Speonk; iron post marked "29 WILLETS PT."	29.780
South Haven; Presbyterian church, northwest corner of foundation wall of; bronze tablet marked "17 WILLETS PT."	17.654
Pachogue railroad freight station; north side of track; in northeast corner of brick wall of; aluminum tablet marked "15 WILLETS PT.".	15.540

FRANKLIN, HAMILTON AND ESSEX COUNTIES.

Newcomb No. 185, Blue Mountain No. 169, Santanoni No. 184, Long Lake No. 168, Saranac Lake No. 183 and St. Regis No. 167 Quadrangles.

The elevations in the following list are based upon a bronze tablet in top of south end of east abutment of Grand Trunk railroad bridge over Salmon river, 600 feet west of Fort Covington station, marked "167 ALBANY 1900". The elevation of this is accepted as 166.453 feet above mean sea level, and is determined from a bench mark of the United States Board of Engineers on Deep Waterways, on the same abutment, the elevation of which is determined to be 1.017 foot lower than given by the Board, by the 1903 adjustment of the precise level net by the United States Coast Geodetic Survey.

The leveling was done under the direction of Mr. Glenn S. Smith, topographer, in 1901, by Mr. C. H. Semper, and in 1902 by Messrs. George Seidel and A. P. Meade, jr., levelmen.

All permanent bench marks dependent on this datum are marked by the letters "Ft. COVINGTON," in addition to the figures of elevation.

	Feet.
Axton via Ampersand and Preston Ponds to Averyville.	
Axton, 6.5 miles east of; 450 feet west of old lumber camp, 10 feet south of road, on large rock 20 x 15 feet; bronze tablet marked "1917 Ft. COVINGTON 1901"	1,917.438
Averyville, 550 feet south of school, 20 feet west of west of margin of road, in large bowlder 8 feet square; bronze tablet marked "2069 Ft. COVINGTON 1901"	2,069.446
Averyville via Lake Placid and along Chateaugay Railroad to Saranac Lake.	
Lake Placid, .4 mile south of station on road to Averyville, on west margin of road, in large rock; aluminum tablet marked "1750 Ft. COVINGTON 1901"	1,750.339
Spur line.	
Saranac Lake; Baptist church, opposite Franklin Hotel; in north face of foundation wall; aluminum tablet marked "1549 Ft. COVINGTON 1901"	1,548.975
Saranac Lake along New York Central Railroad via Lake Clear to Tupper Lake Junction.	
Saranac Inn, 1.7 miles south of; 200 feet south of milepost (Herkimer 46) in middle of rock cut; aluminum tablet marked "1632 Ft. COVINGTON 1901"	1,631.920
Newcomb north along road toward Cold River (Single spur line).	
Newcomb, 7.3 miles north of; on road to Cold River at top of hill; 30 feet east of road; large rock; bronze tablet marked "1910 COVINGTON 1901"	1,909.615
Point ¼ miles west of Newcomb via Lily Pad Pond to Lake Catlin (Single spur line).	
Catlin Lake, Caugnawanga Club House, 50 feet east of boat house; large rock at edge of lake; aluminum tablet marked "1603 COVINGTON 1901"	1,603.091
Tupper Lake south via Moody to Lake Madeline (Single spur line).	
Tupper Lake, 10.6 miles south of; Litchfield Park, 50 feet east of farm house; at entrance of barn; aluminum tablet marked "1748 COVINGTON 1901"	1,747.778
Preston Ponds south along trail and public roads via Upper Iron Works to Tahawas (Excessive error distributed in this line).	
Preston Pond, 800 feet south of; on east margin of trail between Preston Pond and Henderson Lake; rock in surface of; bronze tablet marked "2180 COVINGTON 1901"	2,179.791
Upper Iron Works, opposite Tahawas Club House, 65 feet east of road; large rock; bronze tablet marked "1771 COVINGTON 1901"	1,770.881

Lake Clear Junction north along New York Central and Hudson River Railroad via Paul Smith station to Onchiota.

	Feet.
Lake Clear Junction, west side of railroad; southeast corner of foundation stone of water tower; aluminum tablet marked "1630 COVINGTON"	1,630.474
Paul Smith station, 665 feet west of track, 225 feet north of road to post office; in bowlder; bronze tablet marked "1704 COVINGTON"	1,703.800
Onchiota, 200 feet south of station; east side of track in big bowlder; aluminum tablet marked "1710 COVINGTON"	1,710.514

Paul Smith station, along public roads east to Bloomingdale, thence north via Vermontville to Onchiota.

Bloomingdale station; iron bridge; 70 feet east of north side of road; in large bowlder; aluminum tablet marked "1530 COVINGTON"	1,529.666
Vermontville, 5.6 miles north of; road crossing; large bowlder; aluminum tablet marked "1776 COVINGTON"	1,776.288
Onchiota station, 200 feet south of; east side of track; large bowlder; aluminum tablet marked "1710 COVINGTON"	1,710.514

Paul Smith station west along public roads via Paul Smith post office to Brandon.

Paul Smith post office, 900 feet south of store; corning point; bowlder; aluminum tablet marked "1632 COVINGTON"	1,631.943

ESSEX, WARREN, HAMILTON, FULTON, MONTGOMERY, HERKIMER, ONEIDA, LEWIS, ST. LAWRENCE AND FRANKLIN COUNTIES.

Fonda No. 173, Gloversville No. 172, Fayville No. 188, Speculator, Indian Lake No. 170, Thirteenth Lake No. 186, North Creek No. 204, Newcomb No. 185, Remsen No. 127, Wilmurt No. 141, McKeever No. 126, Old Forge No. 140, Canada Lake No. 155, Little Falls No. 142, Utica No. 128, Nehasane No. 138, Raquette Lake No. 154, Blue Mountain No. 169, Tupper Lake No. 153 and Long Lake No. 168 Quadrangles.

The elevations in the following list are the result of a readjustment of leveling reported upon heretofore to accord with the 1903 adjustment of the precise level net. The initial control elevations for this group of levels in connection with adjacent work are at Tupper Lake Junction and North Creek, by precise level lines of the U. S. Geological Survey and along the Mohawk river by precise leveling of the Army Engineers of 1902.

The leveling in 1896 on the Utica quadrangle was done under the direction of Mr. J. H. Jennings, topographer, by Mr. A. B. Pomme, levelman; that on the Remsen and Wilmurt quadrangles was done under the direction of Mr. W. H. Lovell, topographer, by Mr. E. L. McNair; that of 1897, 1898 and 1899 on adjoining quadrangles was done under the direction of Mr. A. M. Walker, topographer, by Messrs. C. H. Semper, W. W. Gilbert and A. W. Gill, levelmen.

Permanent benchmarks on the Remsen and Wilmurt quadrangles were marked with the letters "R" referring to Remsen datum, those set by Mr. Pomme were marked only with figures of elevation which are mostly two feet too high, the others are marked with the letters "ALBANY" in addition to figures of elevation.

Utica Quadrangle, republished and amended.

	Feet.
Post office, rear of building, west of east basement door; bronze tablet marked "419"	417.207

Stewarts Corners via Moyer Creek to Frankfort.

Rushmer road; first barn east of Stewarts Corners; between third and fourth telegraph poles east of barn, Nos. 9588 and 9587, on bowlder half in road and half in field; copper bolt marked "U. S. G. S. 1380 feet B. M."	1,378.477

Utica north via Trenton Plank Road to South Trenton.

South Trenton, north side of road opposite west gate of cemetery on bowlder, marked "U. S. G. S. B. M. 806 ft."	803.938

Poland to Newport.

Newport, stone bridge over West Canada Creek, in north coping over center pier of; 6 inches south of square chisel mark, and flush with coping; copper bolt marked "U. S. G. S. 658 ft. B.M."	656.450

Ilion.

Steel Creek Aqueduct, Erie Canal; in center of third coping stone from west end; parapet wall; towpath side; copper bolt marked "U. S. G. S. B. M. 410 ft." (0.027 foot higher than State Engineer's B. M. No. 197)	408.574

Frankfort point 5.6 miles north of Frankfort in town of Schuyler.

Frankfort, 5.6 miles north of; at southwest corner of road crossing of road forks; iron post marked "U. S. G. S. B. M. 580 ft."	577.793

Little Falls Quadrangle (in part republished and amended) Little Falls to Salisbury Center via Dolgeville.

Little Falls, southeast corner of Ann and Albany streets; northwest corner of brick building with stone foundation; aluminum tablet marked "397"	397.118
Inghams Mills, 27 feet east of Little Falls and Dolgeville Railroad track; 120 feet north of road crossing rock in place; 6 feet above ground; aluminum tablet marked "726 A"	726.870

Salisbury Center to Middleville via Fairfield.

Salisbury Center, Universalist Church; brick work in rear of church; aluminum tablet marked "1065 A"	1,064.372
Fairfield, Military Academy; Laboratory building; front of south end in stonework 2 feet above ground; aluminum tablet marked "1278 A"	1,277.867
Fairfield Military Academy, laboratory building, front; south end; projection on corner stone 1 foot above ground; old bench mark marked "1276.829 above tide at Troy"	1,276.240

From Middleville to point on Jerseyville Lake Road, 5.5 miles north of Salisbury Center, via Norway and Mexico.

Norway, northwest corner of crossroads opposite hotel; west end of stone foundation of building; 1 foot from face corner; aluminum tablet marked "1320 A"	1,319.830

	Feet.
Salisbury Center, 5.5 miles north of; on Jerseyfield Lake road, and 80 feet north of road; in outcrop 1 foot from southeast corner of Willis Nichols' barn; aluminum tablet marked "1618 A"	1,618.535

Newport to Mohawk via Middleville and Herkimer.

Middleville, West Canada Creek, in coping of iron bridge, west abutment; north wing; copper bolt marked "U. S. G. S. B. M. 572"	570.861
Herkimer, court street, county clerk's office; left of main entrance, in stone watertable; aluminum tablet marked "407 A"	406.975
Mohawk, closing bench on circuit Utica, South Trenton, North Gage, Poland, Newport, Middleville, Herkimer, and Mohawk; Erie Canal Lock No. 42, northeast gate, north lock; coping at end of anchor; marked "⊕ B. M."	397.276

Remsen and Wilmurt Quadrangles (in part republished and amended) Trenton via Prospect, Hinckley and Northwood to near Wilmurt, thence via Ohio to Cold Brook.

Prospect post office, .22 mile north of; in field opposite creamery and east of road in large bowlder 3 x 7 x 12 feet; copper bolt marked "1142 R"	1,141.105
Hinckley, 2.3 miles northeast of and about 1.1 miles west of Oneida-Herkimer county line, in Remsen Township; 55 feet from road center, in pasture, west side of road, in bowlder; copper bolt marked "1262 R"	1,261.647
Northwood, 2.8 miles east of; 3,450 feet west of abandoned house south of road; 7 feet north of center of road on large bowlder; copper bolt marked "1258 R"	1,257.696
Ohio, 750 feet west of corner near church, 1,200 feet east of schoolhouse and 80 feet north of road, in field belonging to G. Johnson; copper bolt marked "1374 R"	1,373.809
Cold Brook, 3.4 miles north of; 3.6 miles south of Ohio; 480 feet south of road from west and 1 mile south of crossing of Black Creek in Russia Township, on west side of road; 3 feet from wire fence; copper bolt marked "1265 R"	1,264.710

Cold Brook to Poland.

Poland, first iron bridge over Cold Brook northeast of village; foundation stone, east abutment, north wing; copper bolt marked "U. S. G. S. B. M. 800 ft."	798.841

From near Wilmurt via Nobleboro to Honnedaga Lake.

Wilmurt, .7 miles west of and 165 feet east of Henry Paull's hotel; in pasture, 70 feet south of center of road; bronze tablet marked "1402 ft R"	1,401.249
Honnedaga Lake, Herkimer Landing, 325 feet from lake; 35 feet southwesterly from corner of barn; in very large bowlder; copper bolt marked "2223 ft. R"	2,222.668

Nobleboro to Morehouseville.

Morehouseville, 940 feet east of road south at post office; 425 feet east of schoolhouse; 15 feet south of center of road to Piseco Lake; in flat ledge; copper bolt marked "1909 ft. B. M."	1,910.160

Prospect to White Lake via Remsen and Forestport.

Remsen, north end of retaining wall between lower mill dam and Rome, Watertown and Ogdensburg Railroad; in end of coping near face corner; bronze tablet marked "1172"	1,171.464
Honnedaga station; .25 mile north of; 40 feet west of track opposite cattle guard; in bowlder 6 x 15 feet; copper bolt marked "U. S. G. S. 1209 ft. R. B. M."	1,208.854

	Feet.
Forestport, .3 mile north of station; north end of railroad bridge over Little Woodhull Creek; west end of parapet coping; copper bolt marked "U. S. G. S. R 1199 ft. B. M."	1,199.054
White Lake station, 50 feet west of railroad track; 10 feet north of wagon road; in bowlder 5 feet broad; copper bolt marked "U. S. G. S. R 1421 Ft. B. M."	1,420.664
Forestport to North Lake via Enos.	
Maple Lake, outlet of; west abutment of bridge over; copper bolt marked "1318 U"	1,317.970
Black River, east side of south abutment of bridge over; copper bolt marked "1598 R"	1,597.267
McKeever and Old Forge Quadrangles, White Lake to Old Forge via McKeever and Fulton Chain.	
White Lake station, 2.5 miles north of; 100 feet north of White Lake Granite Company's switch; west side of track at foot of embankment; iron staple in bowlder 20 feet broad	1,456.819
McKeever, 600 feet south of station; west of railroad track; in rock in cut; copper bolt marked "U. S. G. S. 1544 Ft. B. M."	1,543.828
Fulton Chain, 5 feet north of Wakeley's Hotel; 8 feet east of railroad track; in bowlder; bronze tablet marked "R 1712"	1,711.854
Old Forge, .25 mile west of railroad station, at picnic ground; in bowlder 7 x 12 x 15 feet north of railroad track; bronze tablet marked "R 1733"	1,732.515
Old Forge along north side of Fulton Chain Lakes to Eagle Bay of Fourth Lake.	
Third Lake, Fulton chain, in Bald Mountain House; 40 feet east of dock; 8 feet from north shore of lake; iron post marked "R 1712"	1,712.164
Fourth Lake via Sixth Lake Dam, to Fawn Lake.	
Fourth Lake, Fulton Chain, at Hess Inn; 175 feet east of sea wall on lake front of lawn; 70 feet south of main hotel building; 40 feet north of boathouse and billiard room; on north bank of Fifth Lake outlet, 3 feet northeast of sidewalk crossing; iron post marked "R 1717"	1,716.417
Sixth Lake, Fulton Chain, 125 feet east of north end of dam; in bowlder 4 x 10 feet, 4 feet from edge of dock; bronze tablet marked "R 1788"	1,787.422
Fawn Lake, 1.5 miles south of; on road from Sixth Lake to Kenwells, 900 feet south of summit, 25 feet north of small brook; in bowlder 12 feet square; 8 feet high; 10 feet east of road at south end of level stretch of road; bronze tablet marked "R 2263"	2,262.079
White Lake to Honnedaga via North Lake.	
White Lake, 50 feet west of railroad track at station; 5 feet north of roadway, in large bowlder; copper bolt marked "1421 U. S. G. S. Ft. A"	1,420.664
North Lake, 6.3 miles northwest of; at junction of road to Woodhull Lake; aluminum tablet in top of rock, marked "1947 A"	1,947.329
North Lake, 100 feet east of State house, in rock; aluminum tablet marked "1829 R"	1,828.245
Honnedaga Lake, 400 feet west of; on road to North Lake; north side of road; large rock; bronze tablet marked "2221 A"	2,221.110
Canada Lake, Indian Lake and Piseco Quadrangles, Honnedaga Lake, via Third Stillwater, West Canada Lakes and Cedar Lakes to Little Moose Lake.	
Honnedaga, Forest Lodge; south face of large bowlder 50 feet north of office building; aluminum tablet marked "2205 A"	2,205.015
Honnedaga, 1.3 miles east of; at Herkimer-Hamilton county boundary line, north side of trail; in large bowlder; transit station No. 21 of county line survey; bolt of	2,149.390

	Feet.
Honnedaga, 7.8 miles east of; 250 feet east of ford of West Canada Creek near head of second Stillwater in bowlder; aluminum tablet marked "2168 A"	2,168.067
Mud Lake Dam, 125 feet north of sluice of; 100 feet north of Indian Hut; in large white bowlder; aluminum tablet marked "2356 A"	2,355.722
Buck, 400 feet east of Cedar Lake; on trail to Speculator; northwest corner of camp; copper bolt marked "U. S. G. S. B. M. 2472 Ft. A"	2,472.429

Wakeley Dam and Little Moose Lake to Fawn Lake.

Little Moose Lake, 200 feet from; in rear of log house; in large rock; copper bolt marked "2143 A"	2,144.184
Little Moose Lake, 4.5 miles west of; on road to Kenwells; .3 mile west of Silver Run, at summit of hill, in large rock; 5 feet south of road; aluminum tablet marked "2049 A"	2,049.583
Kenwells, 3,150 feet northeast of; north side of road to Fourth Lake and Wakeley Dam; in large rock; aluminum tablet marked "1854 A"	1,855.475

Morehouseville to Speculator via Piseco.

Piseco; Irondequoit club house basement; aluminum tablet marked "1703 A"	1,702.803
Lake Pleasant, north side of stone jail; 6 inches east of northeast corner; 3.5 feet above ground; aluminum tablet marked "1791 A"	1,790.543
Speculator, in small triangular rock at crossroads; copper bolt marked "1772 A" (This bolt was set in 1896 and its elevation has been published as 1767.200)	1,768.369

Piseco to Third Stillwater of West Canada creek, via Spruce Lake.

Piseco, 5 miles north of; 50 feet north of old road running northeast to old lumber camp; in large bowlder 10 feet east of road; copper bolt marked "1964 A"	1,964.198
Spruce Lake, east side of; at Clark's camp; large bowlder; copper bolt marked "2382 A"	2,382.139

Fulton Chain via New York Central and Hudson River Railroad to Long Lake West.

Clearwater, 600 feet south of; 35 feet east of track; in west face of large bowlder; bronze tablet marked "1753 ALBANY"	1,751.911
Big Moose, 110 feet east of point of switch at east end of side track, 40 feet south of main track; 25 feet west of west line of Hennessey's Hotel; in northwest face of large bowlder; bronze tablet marked "2036 ALBANY"	2,034.324
Woods Lake, .37 mile south of; 62 rails south of station; 575 feet north of 100 milepost, 125 feet south of small stream, 20 feet west of track, in northeast face of large bowlder; bronze tablet marked "1881 ALBANY"	1,879.778
Beaver River, east side of railroad water tank; in east face of foundation stone under south support; aluminum tablet marked "1693 ALBANY"	1,691.863
Keepawa station, 38 rails north of; 75 feet north of 90-mile post, 100 feet west of track; in east face of large bowlder; aluminum tablet marked "1722 ALBANY"	1,720.968
Nehasane, 200 feet south of Mr. Ames' house (Nehasane station); 20 feet west of main track; in east face of ledge of rock; aluminum tablet marked "1789 ALBANY"	1,787.530
Bog Lake, 1.25 miles north of; 35 rails north of milepost; 81 miles from Malone; 35 feet west of track; in east face of large bowlder; aluminum tablet marked "1764 ALBANY"	1,762.673
Long Lake West, 215 feet north of People's Hotel; 30 feet east of track in west face of outcrop of rock; aluminum tablet marked "1789 ALBANY"	1,787.787

Long Lake West via Childwold, Tupper Lake, Wawbeek, and Axton to Foot of Long Lake.

	Feet.
Horseshoe station; 50 feet north of station; 50 feet west of track in east of large bowlder; 1 foot above ground; aluminum tablet marked "1739 A"	1,738.177
Childwold, 40 rails south of station on left side of track; in face of rock cut; aluminum tablet marked "ALBANY 1713"	1,713.164
Tupper Lake Junction, New York Central and Hudson River Railroad, Adirondack Division, in foundation to water tank of; aluminum tablet marked "1555 ALBANY"	1,556.031
Raquette Falls, 150 feet west of Martin Talbot's, in bowlder; aluminum bolt marked "ALBANY 1574"	1,574.634
Long Lake, island in lower end of; 420 feet west of house owned and occupied by Amos Robinson, in top of bowlder; aluminum bolt marked "1638 ALBANY"	1,638.211

Long Lake West to Long Lake, via Little Tupper Lake.

Long Lake West, 4 miles east of; opposite 15-milepost; 10 feet from road; in southeast face of large bowlder; aluminum tablet marked "1839 ALBANY"	1,838.171
Little Tupper Lake, head of; at Loomis' Camp; 150 feet southeast of camp; 25 feet from barn; north face of large bowlder; aluminum tablet marked "1760 ALBANY"	1,758.446
Little Tupper Lake, .12 mile east of; 115 feet west of 10-milepost, 8 feet north of road; 25 feet west of blacksmith shop at Moynehan's lumber camp; west face of large bowlder; aluminum tablet marked "1739 ALBANY"	1,738.170
Big Brook, 250 feet north of, 12 feet east of road, west face of large bowlder; aluminum tablet marked "1722 ALBANY"	1,720.965

Brandeth Station via Brandeth and Raquette Lakes to Grove House, Long Lake.

Brandeth Lake, Brandeth Camps, northwest corner of clearing; 10 feet east of road; 40 feet south of edge of woods; south face of bowlder; aluminum tablet marked "1915 ALBANY"	1,913.224
Brandeth Lake, foot of; 30 feet west of State road; 12 feet south of Brandeth Outlet, in northeast face of large bowlder; aluminum tablet marked "1884 ALBANY"	1,882.656
Raquette Lake, Antler's Hotel; 30 feet west of ice house; in bed rock; aluminum tablet marked "1811 ALBANY"	1,809.926
Raquette, Forked Lakes Carry, at southwest corner of Carry and State road, 5 feet from road; 15 feet from Carry, in face of large bowlder; aluminum tablet marked "1796 ALBANY"	1,796.420
Long Lake, head of; 2.75 miles southwest of; at fork in State road where road goes to Forked Lake; 130 feet east of fork; 50 feet south of road; north face of large bowlder; aluminum tablet marked "1726 ALBANY"	1,726.514

Blue Mountain Lake to Upper Dock, Marion River Carry.

Marion River Carry, opposite the upper dock of; in the east face of ledge of rock on north side of road; aluminum tablet marked "ALBANY 1793"	1,794.119

Cedar River House to Wakeley Dam.

Brown's house, .75 miles beyond; 7.62 miles from main road; 20 feet north of bridge over small stream flowing to left; 15 feet to right of and 5.3 feet above center of road; copper bolt marked "U. S. G. S. B. M. 1918"	1,913.585
Wakeley Dam, 25 feet east of north of log house at; in bowlder; copper bolt marked "U. S. G. S. B. M. 2124 Ft."	2,119.764

Cedar River House to Forest House.

Forest House, 19.75 miles from North River; 25 feet to north of west of northwest corner of barroom; in outcrop; copper bolt marked "U. S. G. S. 1941 Ft. B. M."	1,937.247

Blue Mountain Lake to Long Lake.

	Feet.
Blue Mountain Lake, foundation of new schoolhouse; in second stone from southwest corner of second course from top; bronze tablet marked "1810"	1,805.700
Long Lake, 5.5 miles from; 12 feet to left and 2.5 feet above center of road; in bowlder; copper bolt marked "U. S. G. S. 1855 Ft. B. M."	1,851.176
Long Lake, 260 feet west of Sabattis' two-storied frame house; in west end of outcrop; 130 feet to left of center of road; copper bolt marked "U. S. G. S. 1663 Ft. B. M."	1,658.685

Long Lake to Newcomb.

Four-mile post, 35 feet back from; in outcrop 14 feet to right and 2.5 feet above center of road; copper bolt marked "U. S. G. S. 1863 Ft. B. M."	1,858.465
Newcomb Methodist church, in outcrop 85 feet northeast of; 16 feet to left of and 1.3 feet above center of road; copper bolt marked "U. S. G. S. 1640 Ft. B. M."	1,637.051

MONTGOMERY, FULTON, HAMILTON, WARREN AND ESSEX COUNTIES.

Fonda No. 173, Gloversville No. 172, Fayville 188, Speculator, Indian Lake, No. 170, Thirteenth Lake No. 186, North Creek No. 204, Newcomb No. 185 and Blue Mountain Lake No. 169 Quadrangles.

The elevations in the following list are based upon the "Grist Mill" bench mark near Albany the elevation of which is accepted as 13.863 feet above mean sea level. They result from leveling previously reported upon in the appendix to the Eighteenth Annual Report of the Director readjusted in conjunction with later work to accord with the 1903 adjustment of the precise level net. The elevations marked on the permanent bench marks are mostly based upon the North Creek datum according with a bronze tablet in the quartz outcrop on the southwest side of the railroad track, 1,000 feet north of North Creek railroad station which is marked 1012 feet. This height was obtained through an adjustment of spirit levels brought via the Adirondack railroad and is found to be about 4 feet in error by the connection made by precise levels from Schenectady which gives the elevation 1008.049 feet for that tablet. In consequence all bench marks of this list set in 1896 are marked with figures of elevation 4 feet too high.

The leveling was mostly done in 1896 under the direction of Messrs. W. H. Lovell and W. M. Beaman, topographers, by Messrs. Clark Brown and A. F. Krause levelmen.

Auriesville along Canal and Fonda, Johnstown and Gloversville Railroad via Fonda, Gloversville and Northville to Gilman Lake. (Part of this line was run in reverse direction.)

	Feet.
Schoharie creek aqueduct, Erie canal; on corner stone of northwest abutment of first bridge west of (State Engineer's bench mark No. 102)	302.279
Auriesville, West Shore railroad station, bridge over canal ⅝ mile west of; northwest end of west wing, north abutment, in corner stone; State Engineer's bench mark No. 106; chiseled square	302.785
Fonda, County Court House, in corner stone of fourth course of stones from top of foundation at northwest corner; bronze tablet marked "294"	293.764
Johnstown, Fonda, Johnstown and Gloversville railroad station; in first stone below brickwork at west corner of building; bronze tablet marked "652"	652.008
Gloversville, Fonda, Johnstown and Gloversville railroad station; in first stone below brickwork 20 feet north of southwest corner of building; bronze tablet marked "798"	798.136
Mayfield, 60 feet east of gristmill; 30 feet from creek; 90 feet south of railroad track; in bowlder 5 feet broad; copper bolt marked "U. S. G. S. B. M. 756 ft."	752.199
Cranberry Creek, Main street, 300 feet north of railroad crossing and 100 feet west of railroad track, in bowlder 3 feet high; copper bolt marked "U. S. G. S. B. M. 768 ft."	763.790
Hope District schoolhouse No. 4, 75 feet west of; bowlder 15 feet north of road; copper bolt marked "U. S. G. S. B. M. 832 ft."	828.311
Wells, Hosley House, in back yard of hotel, on rock 15 feet broad and 5 feet high; bronze tablet marked "1026"	1,022.17
Charley Lake, schoolhouse opposite, 25 feet southwest of school, in bowlder 8 feet broad; copper bolt marked "U. S. G. S. B. M. 1719 ft."	1,714.685

Speculator to Jessups River, Hamilton County.

Speculator, small triangular park at crossroads; in bowlder (P 40 B 1); copper bolt marked "U. S. G. S.; 1772 ft. B. M."	1,768.369
Jessups River bridge, 50 feet west of on north bank of river, in outcrop 5 feet above center of bridge; copper bolt marked "U. S. G. S.; 1689 ft. B. M."	1,685.012

Jessups River to Lewey River.

Lewey Lake, 100 feet from water line on south shore of, 300 feet north of Lewey Lake house; in bowlder 8 feet broad; copper bolt marked "U. S. G. S. 1659 ft. B. M."	1,654.964

Lewey River to Indian Lake.

Beaver Meadow Brook bridge, 900 feet southwest of; outcrop, 3 feet above and 20 feet north of road; copper bolt marked "1799 ft. U. S. G. S. B. M."	1,795.112

Kings Flow Dam to Ross (Kunjamuck).

Kings Flow Dam, 500 feet northwest of bridge at; 10 feet to right of and 1 foot above road; copper bolt marked "U. S. G. S. 1724 ft. B. M."	1,720.016

Ross to Speculator.

Ross' Kunjamuck House, 2,000 feet south of; 8 feet east of road in bowlder 6 by 4 by 2 feet; copper bolt marked "1774 ft."	1,770.375
Rylander Clearing, west of Elm Lake, 300 feet south of house foundation, 1,000 feet north of top of hill in road, in flat outcrop 6 feet west of road; copper bolt marked "U. S. G. S. B. M. 1952 ft."	1,947.992

Trail, Gilman Lake to Griffin.

	Feet.
Griffin, 30 feet above mill dam, 5 feet north of road, 5 feet south of river; copper bolt in rock, marked "U. S. G. S. B. M. 1280 ft."	1,275.948

North Creek to North River.

North Creek, 100 feet north of railroad station; quartz outcrop on southwest side of track, 2 feet above track, 6 feet from southwest rail; bronze tablet marked "1012"	1,008.048
North River, 40 feet west of northwest corner of Thirteenth creek bridge, 30 feet east of corner of house; copper bolt marked "U. S. G. S. B. M. 1076 ft."	1,072.257
North River, 300 feet west of bridge at, top of copper bolt of Adirondack Survey—Triangulation station, No. 118, 1882. (Said to mark Warren-Essex county line.)	1,080.929

Sodom via Bakers Mills to Mountain House.

Bakers Mills, 50 feet north of blacksmith shop and 25 feet west of road; in bowlder 6 feet broad and 2 feet above ground; copper bolt marked "U. S. G. S. B. M. 1585 ft."	1,581.042

Mountain House via Thirteenth Lake to Kings Flow Dam.

Big Shanty Dam, 200 feet southeast from east end of; in bowlder 3 feet high and 8 feet broad; copper bolt marked "U. S. G. S. 1666 ft. B. M."	1,662.383
Thirteenth Lake House, 75 feet in front of; in low flat outcrop; copper bolt marked "U. S. G. S. 1874 ft. B. M."	1,860.761

Griffin to Mountain House.

Stuarts Creek, 300 feet northeast of; point 5 feet west of road outcrop; copper bolt marked "U. S. G. S. 1377 ft. B. M."	1,373.140
Oregon, 1,000 feet north of the North House (McKlosky's) and 150 feet north of curve to right in road; bowlder 5 by 10 feet to right of road; copper bolt marked "U. S. G. S. B. M. 1435 ft."	1,431.005

North River to Indian River via Summit.

Spring's white house, southeast of, in front of log house, 10 feet to left of and 2 feet above road; copper bolt marked "U. S. G. S. B. M 1834 ft."	1,830.049

North Creek via Minerva to Aiden Lair.

Minerva, in north end of picket fence southeast of Kellogg House; in large bowlder 15 feet to right and 1.5 feet above road; copper bolt marked "U. S. G. S. 1393 ft. B. M."	1,389.009
Minerva, 1.75 miles north of Kellogg House at junction with road to North Woods Club, 80 feet east of; south of schoolhouse 26 feet to right of and 7.3 feet above center of road, in outcrop; copper bolt marked "U. S. G. S. 1742 ft. B. M."	1,737.854
Aiden Lair Lodge, 50 feet southeast of; copper bolt in bowlder, marked "U. S. G. S. 1659 ft. B. M."	1,659.022

Aiden Lair to Newcomb.

Havron's (Daniel) House, .62 mile beyond, in large bowlder 12 feet to left and 2.8 feet above center of road; copper bolt marked "U. S. G. S. 1737 ft. B. M."	1,732.862
Newcomb Methodist church, 85 feet northeast of door of, 16 feet to left and 1.3 feet above center of road; copper bolt marked "U. S. G. S. 1640 ft. B. M."	1,637.003

Newcomb to Hamilton-Essex county line.

Beldin's (Abner) house, 460 feet back from; on large bowlder 14 feet to right of and 3.8 feet above center of road; copper bolt marked "U. S. G. S. 1603 ft. B. M."	1,599.473

	Feet.
Essex-Hamilton county line, .87 mile west of; in bowlder 12 feet left of and 3.5 feet above center of road; copper bolt marked "U. S. G. S. 1698 ft. B. M."	1,694.227
Mouth of Indian River to Chain Lakes.	
Cedar River, south bank of, 20 feet southwest of ferry on road to Chain Lakes, in outcrop, copper bolt marked "U. S. G. S. 1549 ft. B. M."	1,544.603
Chain Lakes, 3d of; 50 feet from and 12 feet above water surface, in outcrop; copper bolt 1,100 feet northwest of hotel	1,610.793
Mouth of Indian River to North Woods Club.	
Hudson River, southwest bank, junction of with northwest bank of Indian river, in recess at upper southwest corner of bowlder; copper bolt marked "U. S. G. S. 1428 ft. B. M."	1,423.897
North Woods Club to Moose Pond Club via Nate Pond.	
North Woods Club House, bowlder 200 feet northeast of; copper bolt marked "U. S. G. S. 1769 ft. B M."	1,764.825
Moose Pond Club House, 100 feet northwest of; in large bowlder by shore; copper bolt marked "U. S. G. S. 2095 ft. B. M."	2,091.399
Indian River to Bench Mark south of Village of Indian Lake.	
Indian Lake Village, .5 mile from on road to Indian Lake (Sabael post-office); west end of smooth sloping outcrop 75 feet in length, 10 feet from road and 20 feet east of elm tree 8 inches in diameter; copper bolt marked "U. S. G. S. 1793 ft. B. M."	1,788.807

Herkimer, Hamilton, Fulton and Momtgomery Counties.

Wilmurt No. 141, Piseco No. 156, Lassellsville No. 157 and Gloversville No. 172 Quadrangles.

The elevations in the following list are based upon the "Grist Mill" bench mark near Albany, the elevation of which is now accepted as 13.863 feet above mean sea level. The older work to which this group of level lines ties has been readjusted in conjunction with this work to accord with the 1903 adjustment of the precise level net.

The leveling on the Gloversville quadrangle was done in 1900 under the direction of Mr. W. H. Lovell, topographer, by Mr. William Kelley, levelman; that on the Lassellsville quadrangle was done in 1901 under the direction of Mr. A. C. Roberts, topographer, by Mr. William Kelley, levelman; and that on the Piseco quadrangle was done in 1902 under the direction of Mr. J. H. Jennings, topographer, by Mr. James B. Maguire, levelman.

The line from Salisbury Center to Morehouseville was run in 1898 under Mr. A. M. Walker, topographer.

All permanent bench marks dependent on this datum are marked with the letters "Albany" in addition to the figures of elevation.

St. Johnsville north along road via Oppenheim to Stratford, thence west to Salisbury Center.

	Feet.
St. Johnsville, 1.4 mile south of; B. M. 34 A (1875), lock No. 33, Erie canal; in west wing wall of north (towpath) abutment of first bridge west of; point on top of projection of stone in second course of masonry	319.345
St. Johnsville, Grace church (Christian); at southwest corner of; in water table; aluminum tablet marked "360 ALBANY"	360.523
Oppenheim, southwest corner of brick residence of John P. Swartout; on western side; in limestone water table; bronze tablet marked "1110 ALBANY"	1,109.818
Stratford, near southeast corner of Crossman's Hotel; on southerly side; in foundation wall; bronze tablet marked "1074 ALBANY"	1,074.472

Oppenheim east along road via Garoga to Johnstown.

Lassellsville, southeast corner of D. C. Leeks' store; in foundation wall on east face; aluminum tablet marked "1153 ALBANY"	1,152.969

Stratford north along road via Oregon to Rudiston.

Oregon, near northwest corner of schoolhouse at Oregon; in large bowlder on east side of road; bronze tablet marked "1511 ALBANY"	1,511.201
Oregon, 4.2 miles north of; 300 feet north of Pawley House; in large table rock east side of road; aluminum tablet marked "1674 ALBANY"	1,674.064
Rudiston, 1.7 miles south of; in east end of north abutment of highway bridge over outlet to Piseco Lake at mill; bronze tablet marked "1666 ALBANY"	1,666.813

Mill south along road via Arietta to Garoga.

Arietta, 4.7 miles north of; in east side of road at Gus Avery's house, in large rock; bronze tablet marked "1703 ALBANY"	1,703.252
Arietta, 240 feet north of Alex. Baudin's hotel; on west side of road, in bedrock; bronze tablet marked "1696 ALBANY"	1,696.974
Garoga Corners, in field about 150 feet east of road intersection at; in top of large bowlder; bronze tablet marked "1527 ALBANY"	1,527.198
Rockwood, .67 foot from southeast corner of Caleb A. Long's residence; in south face of foundation wall; bronze tablet marked "1045 ALBANY"	1,045.380

Garoga Corners northwesterly along road via Bleecker Center, Benson Center, and Benson to Northville. (The error distributed in this line is excessive.)

Benson Center Corners, 17 feet westerly from bars in wall; in field on farm of Ludwick Politch; on large boulder; aluminum tablet marked "1288 ALBANY"	1,288.862
Benson, 185 feet east of the Methodist church; nearly opposite Benson post office on north side of road; in top of large boulder; aluminum tablet marked "1139 ALBANY"	1,138.783

Peters Corners south along road to Bleecker village (single spur line).

Bleecker village; in front of school house; District No. 4; on south side of road in top of large boulder; aluminum tablet marked "1506 ALBANY"	1,505.840

Morehouseville north along roads and trails to Metcalf Lake (single spur line).

Metcalf Lake; on boulder on west side of trail; bronze tablet marked "2380 ALBANY"	2,380.908

Salisbury Center north along road to Morehouseville. (The error distributed in this line is excessive.)

	Feet.
Jersey Field Lake, 200 feet west of outlet; 100 feet south of lake; in yard of Mrs. Williams' tenant house; on large boulder; tablet marked "1941 A"	1,941.916

SARATOGA, WARREN AND FULTON COUNTIES.

Luzerne No. 205, Saratoga No. 206 and Northville No. 187 Quadrangles.

The elevations published in the following list are dependent on the "Grist Mill" bench mark near Albany. They result from a readjustment of leveling previously reported upon to accord with the 1903 adjustment of the precise level net.

The leveling was done under the general direction of Mr. W. H. Lovell, topographer, by J. E. Thomas, levelman.

All bench marks dependent on this datum are marked with the letters "Albany" in addition to the figures of elevation.

Factory Village to Middle Grove.

	Feet.
Rock City mill, in southeast corner of; 40 feet east of stone bridge; aluminum tablet marked "445 ALBANY"	445.700

Factory Village via Galway and Broadalbin to Mayfield.

Galway, in northwest corner of Presbyterian Church in village of; aluminum tablet marked "838 ALBANY"	838.450
West Galway, in northwest corner of foundation wall of Presbyterian church; bronze tablet marked "871 ALBANY"	871.942
Broadalbin, in southeast corner of brick Baptist church; aluminum tablet marked "820 ALBANY"	820.567

Mayfield via Northampton to Middle Grove.

Mayfield, 60 feet east of Gristmill, 30 feet from creek, 90 feet south of railroad track; in bowlder 5 feet broad; copper bolt marked "U. S. G. S. B. M. 756"	752.199
Hagedorns Mills, south abutment, in southeast corner of bridge over creek; bronze tablet marked "975 ALBANY"	974.824
East Galway, in east side of foundation wall of Baptist church; bronze tablet marked "889 ALBANY"	889.598
Middle Grove, in east end of south abutment of iron bridge over Kayaderosseros creek at; bronze tablet marked "523 ALBANY"	523.515

Hadley to Northampton via Day Center and Batcherlorville.

Hadley, northwest corner of G. West's paper mill; aluminum tablet marked "613 ALBANY"	613.917
Conklingville, west end of south abutment of iron bridge over the Sacandaga river; bronze tablet marked "726 ALBANY"	726.049
Batchelorville, in southwest corner of Presbyterian church foundation wall; bronze tablet marked "771 ALBANY"	770.450
Northampton, in northeast corner of Presbyterian church; bronze tablet marked "790 ALBANY"	789.612

West Day east to Efner Lake (Single spur line.)

	Feet.
Day Center, 3 miles southeast of; on Lake road, near house owned and occupied by John S. Kinney, in ledge of rock; bronze tablet marked "1009 ALBANY"	1,009.590

Edinburg west along road to Northville.

Northville, northeast corner of M. E. church, corner of Main and Washington streets; aluminum tablet marked "802 ALBANY"	802.292

Hadley to Corinth (Single spur line).

Corinth, in northwest corner of Baptist church; bronze tablet marked "626 ALBANY"	626.057

Hadley to Thurman via Warrensburg.

Hadley, 5.5 miles northeast of; on Warrensburg road; west side of road, 300 feet south of house at edge of woods; in ledge of rock; bronze tablet marked "834 ALBANY"	834.025
Warrensburg, on Main street; in southeast corner of stone building used as post office; bronze tablet marked "749"	749.022
Thurman station, 1.25 miles north of; in abutment of bridge 13, Adirondack Railway; aluminum tablet	628.264

Stony Creek to Knowlhurst.

Stony Creek, .4 mile south of; at northwest corner of steel-girder bridge No. 10 over Stony creek; in coping stone of bridge seat; aluminum tablet marked "600 ALBANY 1899"	600.427
Knowlhurst, in foundation wall of Methodist Episcopal church at; southeast corner; bronze tablet marked "1583 ALBANY"	1,584.375

HAMILTON AND OTSEGO COUNTIES.

Richfield Springs No. 143 and Cooperstown Quadrangles.

The elevations published in the following list are based upon the "Grist Mill" bench mark near Albany, the elevation of which is accepted as 13.863 feet above mean sea level. The initial points upon which these levels depend are at Herkimer, Little Falls and Colliersville, points in the precise level net; the bench marks at Herkimer and Little Falls having been recovered by the recent precise leveling of the Army Engineers.

The leveling was done under the direction of Mr. A. M. Walker, topographer, by Messrs. A. W. Gill and W. W. Gilbert, levelmen, during the season of 1899.

All permanent bench marks are marked with the letters "ALBANY" or "A" in addition to the figures of elevation.

Herkimer via Mohawk, Paine's Hollow and Newville to Little Falls.

	Feet.
Herkimer; court house, left side of main entrance, in stone water table; aluminum tablet marked "407 ALBANY"	406.975

	Feet.
Line southeast.	
Mohawk, 3.9 miles southeast of; Gilbert Daly's stable, southwest corner of foundation of; aluminum tablet marked "719 ALBANY"	719.230
Paine's Hollow, .1 mile west of post office; Dr. Henry Greene's stable, on southwest corner of; aluminum tablet marked "1133 ALBANY"	1,133.300
Line continues east to Indian Castle.	
Newville, stone mill belonging to Messrs. Lewis and Spoor, southeast corner of; aluminum tablet marked "552 A"	552.700
Little Falls, southeast corner of Ann and Albany streets; brick building with stone foundation, in northwest corner of; aluminum tablet marked "397 ALBANY"	397.118
Paine's Hollow, south through Jordanville, to Richfield Springs,	
Richfield Springs, northwest corner of Gould avenue and Church street, southeast corner of Universalist church; aluminum tablet marked "1327 ALBANY"	1,327.556
Richfield Springs east via Warren, to East Springfield.	
East Springfield, stone building used as post office; west side of; aluminum tablet marked "1324 ALBANY"	1,324.721
Newville, via Starkville, to East Springfield.	
Starkville, Abram DeGarmo's mill; in wall 1 foot east of northwest corner of building 4 feet above ground; aluminum tablet marked "692 ALBANY"	692.500
Springfield Center south to Cooperstown.	
Springfield Center, foundation of Baptist church; aluminum tablet marked "1257 ALBANY"	1,257.736
Cooperstown, northwest corner of County Court House; aluminum tablet marked "1264 ALBANY"	1,264.480
Colliersville along D. & H. and C. & C. V. R. R.'s to Cooperstown.	
Colliersville, 700 feet east of; bridge No. 54 across Susquehanna river, northeast corner of coping stone of east abutment; bronze tablet marked "1119 ALBANY"	1,118.493
Milford, Methodist church; northeast corner of foundation of; aluminum tablet marked "1207 ALBANY"	1,207.200
Hartwick Seminary, Seminary building, in foundation on east side; aluminum tablet marked "1266 ALBANY"	1,266.390

WASHINGTON, SARATOGA, SCHOHARIE, ALBANY, SCHENECTADY, DELAWARE, GREENE, ULSTER, ORANGE, DUTCHESS AND COLUMBIA COUNTIES.

Schuylerville No. 224, Canajoharie No. 158, Schoharie No. 174, Berne No. 190, Rhinebeck No. 211, Rosendale No. 193, Phoenicia No. 176, Gilboa No. 175, Schunemunk No. 195, Newburg No. 194, Poughkeepsie No. 212, Rhinebeck No. 211, Millbrook No. 229, Dover No. 230, Copake No. 228 and Kinderhook No. 227 Quadrangles.

The elevations in the following list are based upon the "Grist-Mill" bench mark near Albany, the elevation of which is now accepted as 13.863 feet above mean sea level. The bench marks listed were previously reported upon but the elevations given herewith are corrected to accord with the 1903 adjustment of the precise level net.

The work of 1898 on the Canajoharie and Schoharie quadrangles was done by Mr. Clark Brown, levelman, under the direction of Mr. C. C. Bassett, topographer; and on the Schuylerville quadrangle, under the direction of Mr. W. H. Lovell, topographer; the work on the Berne quadrangle was done in 1898 and 1899 under the direction of Mr. A. M. Walker, topographer, by Mr. Seth Van Loan, levelman, and in 1900 under the direction of Mr. Glenn S. Smith, topographer, by Mr. J. H. Hodges, levelman. That on the Rhinebeck, Rosendale, Phoenicia and Gilboa quadrangles was done in 1901 under the direction of Mr. Bassett, by Messrs. Geo. Bailey and W. S. D. Moore, levelmen; that on the Schunemunk and Millbrook quadrangles was done in 1899 under the direction of Mr. Bassett by Mr. Seth Van Loan, levelman, and the remainder was done in 1900 under the direction of Mr. Bassett by Mr. Geo. Bailey, levelman.

All permanent bench marks dependent on this datum are marked with the letters "ALBANY" or the letter "A" in addition to the figures of elevation.

	Feet.
Schuylerville via Burgoyne and Stafford to Saratoga.	
Schuylerville, corner of College and Green streets; school building, under second window from west corner; bronze tablet marked "216 A"....	215.149
Saratoga along Fitchburg and Delaware and Hudson Railroads via Gansevoort to Fort Edward.	
Saratoga, 5.5 miles northeast of; South Wilton church; south side near front, in foundation; bronze tablet marked "327 A"................	326.192
Gansevoort, Empire House hotel; south side, near front, in brick work; bronze tablet marked "246 A"................................	245.213
Schuylerville via Bald Mountain, Middlefalls and Easton Corners to Sarles Ferry.	
Middlefalls, south bank of creek, 75 feet east of covered bridge, southeast corner of brick gristmill; bronze tablet marked "303 A"........	302.767
North Easton (Easton Corners); .1 mile north of; 10-foot arch culvert, southwest wing, first stone back of arch on level with base; bronze tablet marked "332 A"..	331.719
Sarles Ferry via Quaker Springs to Stafford.	
Sarles Ferry, opposite to, on Champlain canal; waste wier No. 7, north wing, southeast corner of coping, painted cross in circle (canal bench mark No. 37 and Deep Waterway bench mark)....................	103.195
Quaker Springs, 600 feet west of crossroads, north side of road; in outcrop; bronze tablet marked "321 A"............................	320.234

	Feet.
Bald Mountain via Durkeetown to Fort Edward.	
Durkeetown Church, south side, 10 feet from rear corner in stone foundation; bronze tablet marked "171 A"	169.928
Fort Edward, High School building; front entrance, in stone pilaster at left side; bronze tablet marked "145 A"	144.571
Schoharie, Albany and Schenectady Counties, Berne Quadrangle, Duanesburg along Delaware and Hudson Railroad to Delanson.	
Duanesburg, 1,000 feet west of Delaware and Hudson station; bridge, on north end of east abutment; bronze tablet marked "681 ALBANY 1898"	680.822
Delanson via Quaker Street and Gallupville to West Berne.	
Gallupville, Dutch church, set in wall near southeast corner; bronze tablet marked "831 ALBANY"	831.310
East Berne via Berne to West Berne.	
Berne, Lutheran church; in southeast corner; bronze tablet marked "1015 ALBANY"	1,014.986
Berne via South Berne and Westerlo to East Berne.	
Westerlo, bridge over creek, in top, of south end of east abutment; bronze tablet marked "1144 ALBANY"	1,144.094
East Berne, west entrance to village, 300 feet east of Berne road intersection, in imbedded stone at bend in road; bronze tablet marked "1174 ALBANY"	1,174.310
East Berne to Altamont.	
Altamont, Altamont Hotel; in foundation wall southwest side of; bronze tablet, marked "464 ALBANY"	464.780
Schoharie, Delaware, Greene and Ulster Counties, Rhinebeck, Rosendale, Phoenicia and Gilboa Quadrangles, Poughkeepsie Bridge along West Shore Railroad to Kingston.	
West Park, West Shore Railway station; in north wall, at northwest corner; bronze tablet marked "113 ALBANY"	113.842
Kingston along Ulster and Delaware Railroad to Phoenicia.	
Kingston, City Hall; in center of face wall of front portico; aluminum tablet marked "223 ALBANY"	223.760
West Hurley, .5 mile east of railroad station; 100 feet northwest of road crossing on south side of highway; bronze tablet set in face of rock, marked "546 ALBANY"	546.312
Shokan, .2 mile east of station; bridge No. 22, west abutment, north end, on bed plate; bronze tablet marked "532 ALBANY"	533.351
Phoenicia, Ulster and Delaware Railroad bridge, south pier, top of east end of; aluminum tablet marked "804 ALBANY"	805.171
Phoenicia to Shandaken.	
Shandaken, steel bridge at forks of road; top of southwest wing wall of; bronze tablet marked "ALBANY 1071"	1,071.401
Shandaken via Big Indian and Oliverea to Slide Mountain Post Office.	
Slide Mountain post office; rock at northwest corner of; bronze tablet marked "ALBANY 1665"	1,665.070
Shandaken to Lexington.	
Westkill, 1.3 miles south of; top of Deep Notch, west side of road, on bowlder; aluminum tablet marked "ALBANY 1901"	1,901.096
Phoenicia via Hunter and Lexington to Prattsville.	
Edgewood, 300 feet north of station; bridge, north pier, east end, in top stone; bronze tablet marked "1790 ALBANY"	1,790.606

	Feet.
Hunter, public school building, in foundation wall; north side of front entrance; aluminum tablet marked "1602 ALBANY"	1,602.562
Jewett Center; East Kill bridge, east abutment, in north end, top stone; aluminum tablet marked "1405 ALBANY"	1,405.728
Lexington, Schoharie creek bridge, north pier, west end, top stone; aluminum tablet marked "1329 ALBANY"	1,329.760
Prattsville, public school building, in front wall; aluminum tablet marked "1164 ALBANY"	1,164.638
Prattsville to Windham.	
Windham, bridge over Batavia creek on road to Hunter; top of north abutment, east end; bronze tablet marked "1517 ALBANY"	1,517.884
Prattsville to Gilboa.	
Gilboa, 800 feet north of; on east side of road; opposite bridge over Schoharie creek; in ledge of rock; bronze tablet marked "1010 ALBANY"	1,010.190
Gilboa to Manorkill.	
Manorkill, white church opposite post office; in southeast corner of; bronze tablet marked "ALBANY 1515"	1,515.295
Gilboa via Blenheim to Breakabeen.	
Blenheim, 300 feet north of post office; northwest side of road to ledge of rock; aluminum tablet marked "813 ALBANY"	813.430
Breakabeen, Lutheran church; aluminum tablet marked "ALBANY 754"	754.323
Franklinton to Livingstonville.	
Livingstonville, Methodist church; in northwest corner of; bronze tablet marked "ALBANY 1077"	1,077.310
Ulster and Orange Counties, Schunemunk and Newburg Quadrangles, Newburg via Erie Railroad to Cornwall.	
Newburg, to right of entrance of post office; at southwest corner of building; tablet marked "ALBANY 95"	94.404
Corwall via Newburg Junction along Erie Railroad to Oxford.	
Cornwall, 600 feet north of; New York, Ontario and Western Railroad bridge; in face of west abutment; bronze tablet marked "ALBANY 271"	271.593
Central Valley, Noxon's store, west of, in large stone in retaining wall, front of Finken's place; bronze tablet marked "ALBANY 488"	487.193
Arden, 300 feet north of station; railroad bridge over stream, in pier top east end; bronze tablet marked "ALBANY 519"	518.554
Doyle's, .25 mile east of; in face of large bowlder; in road; bronze tablet marked "ALBANY 718"	717.780
Oxford via Burnside to Cornwall.	
Greycourt, Lehigh and Hudson River railway bridge over road; in face of north abutment; bronze tablet marked "ALBANY 447"	446.128
Burnside, 1.25 miles east of; east face of road; bridge abutment; bronze tablet marked "ALBANY 357"	356.695
Newbury via Coldenham and Walden to New Hurley Station.	
Newburg, post office building; in southwest corner of; to right of entrance; aluminum tablet marked "95"	94.404
Coldenham, .2 mile west of; at entrance to A. B. Lindsay's place; large stone gatepost; aluminum tablet marked "ALBANY 434"	434.619
Walden, "National Bank of Walden;" in southeast corner of; aluminum tablet marked "ALBANY 376"	376.136
New Hurley Station via Gardiner and New Paltz to Lloyd.	
Gardiner station, 150 feet south of; in east wall of culvert; bronze tablet marked "ALBANY 309"	308.097

	Feet.
New Paltz, New Paltz Savings Bank, in southwest corner; bronze tablet marked "ALBANY 237"	236.022
Lloyd, Centerville Hotel; in southeast corner of; bronze tablet marked "ALBANY 359"	358.177

Lloyd to Clintondale.

Clintondale, Ambrose's store; in southwest corner of; bronze tablet marked "ALBANY 553"	552.740

Dutchess and Columbia Counties, Poughkeepsie, Rhinebeck, Millbrook, Dover, Copake and Kinderhook Quadrangles, Poughkeepsie.

Station, second step from east end of column on north side of arch bridge; keyed in fifth stone above ground; brass bolt marked "+"	43.334
City Hall; in front face; aluminum tablet marked "ALBANY 173"	172.991

Poughkeepsie via Pleasant Valley and Salt Point to Clinton Corners.

Pleasant Valley, 300 feet east of station; in face of rock north side of track; bronze tablet marked "ALBANY 211"	211.416
Clinton Corners, north end, west abutment bridge over Salt Point Creek; in coping stone; bronze tablet marked "ALBANY 244"	244.735

Clinton Corners via Washington Hollow and South Millbrook to Dover Plains.

Millbrook, west side of Millbrook Bank near southwest corner; aluminum tablet marked "ALBANY 568"	568.824
Dover Plains, in northwest corner of Bank; aluminum (bronze) tablet marked "ALBANY 406"	406.566

Dover Plains via Wassaic and Amenia along Harlem railroad to Millerton.

Amenia, in cornerstone southwest corner of Amenia Bank; aluminum tablet marked "ALBANY 573"	573.87

Millerton via Shekomeko along Newburg, Dutchess and Connecticut Railroad to Pine Plains.

Millerton in northeast front of brick block hotel; aluminum tablet marked "ALBANY 701"	701.081
Pine Plains, in foundation stone of Myer's dwelling, near southeast corner of house; aluminum tablet marked "ALBANY 474"	474.626

Pine Plains via Stissing and Stanfordville to Clinton Corners.

McIntyre, in face of south abutment, third course from ground, Central New England bridge at; aluminum tablet marked "ALBANY 399"	399.388

Millerton via Boston Corners, Craryville and Philmont to Chatham.

Boston Corners, 300 feet south of station; in top of southeast corner of culvert on New York Central Railroad; bronze tablet marked "ALBANY 727"	727.139
Craryville, 500 feet west of station; south side of track in west abutment of railroad bridge; bronze tablet marked "ALBANY 635"	635.151
Philmont, Empire House, in west side of; in stone over cellar window; bronze tablet marked "ALBANY 525"	525.504
Chatham, east side of tenth roof support from east end of station train side, being a bench mark of the Massachusetts topographic survey commission; tablet	470.912
Chatham, in northeast corner of Masonic Block, about 3 feet from ground; aluminum tablet marked "ALBANY 470"	470.90
Chatham, 1 mile north of; on west abutment of bridge No. 201, top stone, being bench No. 84 of the Massachusetts topographical survey commission, marked by a hole and "B. S." bottom of hole	519.457

Niverville via Stuyvesant to Hudson.

	Feet.
Niverville, alongside Rinderbrook river, in watertank at; near northwest corner of in brick about 4 feet from ground; being a bench mark of the Massachusetts topographical survey commission, marked " B-O-M," center of hole	322.936
Niverville, in southwest corner of brick water tank; 3 feet from ground; bronze tablet marked "ALBANY 323"	322.924
Stuyvesant Falls, bridge over Kinderhook Creek, west end of; in end of north wing wall; bronze tablet marked "ALBANY 156"	156.376
Hudson, upper station, on northeast end of; 1 foot from ground; bronze tablet marked "ALBANY 151"	151.543
Hudson station, United States Coast and Geodetic Survey bench mark No 4, described by them, "A. R. R. bench, the usual rounded head bolt, in west side of top of stone pier under iron column, under overhead bridge in street leading to docks and Athens ferry. The first one north of Hudson station. The pier is under the second column from south end in the east row of three."	10.686

Montgomery and Schoharie Counties, Canajoharie and Schoharie Quadrangles, Canajoharie to Ames.

(Mean of direct and reverse lines.)

Canajoharie, Union free school, west front; south of stone steps, in stone balustrade; aluminum tablet marked "A 350"	350.301

Blaine via Sharon to Little York.

Blaine, 50 feet from east coping of cemetery wall; aluminum tablet marked "A 943"	943.315
Sharon, opposite Lutheran church and schoolhouse, outcropping ledge in field, southwest of road; aluminum tablet marked "A 1212"	1,211.822

Sharon to Sharon Springs station via Sharon Center and Sharon Springs.

Sharon Springs, 700 feet north of main east and west road through Rockville, 500 feet from top of hill; in outcrop on west side of street; aluminum tablet marked "A 1295"	1,295.007

Sprout Brook to Hessville.

Hessville, .5 mile south of schoolhouse; 150 feet north of road to west, opposite house and 15 feet east of road; in bowlder 8 feet broad; aluminum tablet marked "A 826"	825.987

Fort Plain to Hallsville.

Fort Plain, Union free school; Division street front; water table 1 foot from south corner; aluminum tablet marked "A 316"	317.090
Hallsville, south end of cheese factory; stone foundation 1 foot from east corner; aluminum tablet marked "A 509"	509.242

Sharon east to Little York thence south to Barnerville.

Barnerville, 200 feet west of covered bridge; 100 feet north of Main street; at iron bridge over mill race, south abutment, east wing; aluminum tablet marked "A 827"	827.253

Barnerville to Schoharie via East Cobleskill.

Schoharie, court house, south side of south door in west front; bevelled jamb; aluminum tablet marked "A 611"	611.077

Schoharie to Cobleskill via Middleburg, Fultonham, Watsonville, West Fulton and Warnerville.

Middleburg schoolhouse, east front, south of entrance; in foundation wall; aluminum tablet marked "A 649"	649.551
West Fulton, iron bridge across Panther creek, south abutment; east side; in coping; aluminum tablet marked "A 1156"	1,157.150

Breakabeen.

	Feet.
Breakabeen, Lutheran church; in foundation west side; 5 feet from corner; aluminum tablet marked "A 754"	754.323

Middleburg to Franklinton.

Franklinton, at schoolhouse; southwest corner of foundation; aluminum tablet marked "A 1215"	1,214.907

ULSTER, DELAWARE, SCHOHARIE AND OTSEGO COUNTIES.

Kingston No. 193, Margaretville No. 161, Hobart No. 160 and Richmondville No. 159 Quadrangles.

The elevations in the following list are based upon the "Gristmill" bench mark at Greenbush near Albany, the elevation of which is accepted as 13.863 feet above mean sea level. They result from adjustment with previous work to accord with the Coast and Geodetic Survey adjustment of 1903 at Poughkeepsie and East Worcester, points in the precise level net.

The leveling was done in 1901-2 under the direction of Messrs. J. H. Jennings and C. C. Bassett, topographers, by Messrs. W. E. Green and Wm. Kelley, levelmen.

All permanent bench marks dependent on this datum are marked with the letters "ALBANY" in addition to the figures of elevation.

Shandaken along Ulster and Delaware Railroad via Big Indian and Pine Hill to Hobart.

	Feet.
Shandaken, steel bridge at forks of road; top of southwest wing wall of; bronze tablet marked "ALBANY 1071"	1,071.401
Fleischmans station, U. & D. bridge No. 47, east abutment, south end; aluminum tablet marked "1515 ALBANY 1901"	1,515.771
Halcottsville, 550 feet south of; U. & D. bridge 54, on top of south abutment at west end; bronze tablet marked "1399 ALBANY 1901"	1,399.691
Roxbury, .85 mile north of; U. & D. bridge 59, north abutment, east end of; aluminum tablet marked "1499 ALBANY 1901"	1,499.601
Grand Gorge, 125 feet east of main track and 100 feet north of station; large bowlder, top of; aluminum tablet marked "1561 ALBANY 1901"	1,561.901
Hobart, ¼ mile east of; bridge 70, west abutment, south end of back wall; aluminum tablet marked "1633 ALBANY 1901"	1,634.701

Stamford along Highways via Harpersfield to East Worcester.

Stamford, Joseph Millan's brick store on main street, northwest corner of, 3 feet north of, northwest face; aluminum tablet marked "1826 ALBANY 1901"	1,827.244
South Worcester store (Olmstead & Sturges), southeast corner of, 6 feet north of, east side of foundation wall; aluminum tablet marked "1373 ALBANY 1901"	1,374.016
East Worcester, station (precise line) .75 miles west of; culvert, north end of; tablet marked "1406 ALBANY 1901"	1,405.207

	Feet.
Arkville along public road to West Shandaken.	
West Shandaken, 5.45 miles from Arkville, front of Second Adventist church, southwest corner of; bronze tablet marked "1628 ALBANY 1901"	1,628.726
Arkville (along highway) via Margaretville, Arena and Grant's Mills to Ulster and Delaware County line on Coykendall Road.	
Margaretville, People's Bank, stone steps at entrance to, westerly face of; aluminum tablet marked "1325 ALBANY 1901"	1,325.581
Grant's Mills, 2.9 miles south of; line between Delaware and Ulster counties; 1380 feet northwesterly from large culvert, north side of Coykendall road, large rock; bronze tablet marked "2464 ALBANY 1901'	2,465.526
New Kingston, U. P. church, north face of, 2 feet west of a belfry tower; aluminum tablet marked "1685 ALBANY 1901"	1,685.745
Road intersection 1 mile west of North Kortright P. O. to North Harpersfield.	
North Harpersfield, residence of Jas. A. Topping, southerly side of, under bay window foundation wall; bronze tablet marked "1609 ALBANY 1901"	1,610.221
Stewart, in southeast corner of postoffice (Martin Vroman's house); bronze tablet marked "1364 ALBANY 1902"	1,364.230
Cobleskill north along Cherry Valley branch of Delaware and Hudson Railroad via Hyndsville and Seward to Sharon Springs.	
Seward, in front wall of general store; bronze tablet marked "1186 ALBANY 1902"	1,186.486
Seward west along public road to South Valley (Single spur line).	
South Valley, Christian church; bronze tablet marked "1563 ALBANY 1902"	1,563.183
Shokan along public road to Alligerville.	
Olive City, 5.9 miles south of; at L. D. Christiana House; in northeast corner of foundation wall; bronze tablet marked "827 ALBANY 1902"	827.287
Alligerville along towpath of D. & H. Canal to Rosendale.	
Alligerville, iron highway bridge over Rondout Creek, south abutment of, east end of; bronze tablet marked "220 ALBANY 1901"	220.405
South Rifton, 150 feet from postoffice, east side of road, rock ledge; bronze tablet marked "170 ALBANY 1901"	169.887

JEFFERSON AND ST. LAWRENCE COUNTIES.

Clayton No. 78, Theresa No. 88 and Alexandria Bay No. 87 Quadrangles.

The elevations published in the following list are based upon permanent bench marks established in the course of the precise leveling by the Deep Waterways Board at Clayton, Fishers Landing, Alexandria Bay and Chippeway village, in the vicinity of Cape Vincent. Elevations of these are derived by the 1903 adjustment of the precise level net.

The leveling was executed under the general direction of Mr. W. H. Lovell, topographer, by Mr. Wm. Kelley, levelman, in 1900.

All permanent bench marks dependent on this datum are marked with the letters "CAPE VINCENT" in addition to figures of elevation which accord with the Deep Waterways Board elevations at Cape Vincent, as published by the Board in 1900, and which are approximately 1 foot higher than the present accepted elevations.

Clayton via Clayton Center and Depauville to Limerick.

	Feet.
Clayton, Catholic church; in water table at southwest corner of; copper bolt	278.815
Clayton, James street; in front of Mrs. Linnell's residence on back part of top of fire hydrant; copper bolt marked "CAPE VINCENT 289"	287.631
Clayton Center, residence of Merritt Lengenfelter; on west face of building at south corner of stone foundation wall; bronze tablet marked "CAPE VINCENT 423"	422.071
Depauville, at crossroads in; under residence of Ira Gillette; in east corner of stone foundation wall; aluminum tablet marked "299 CAPE VINCENT"	297.525
Perch River, stone schoolhouse; in northeast corner of water table; bronze tablet marked "338 CAPE VINCENT"	336.950

Limerick via Chaumont to Threemile Bay.

Chaumont, Main street, Hiram Copley's stone office building; in north face of buttress at northwest corner of; aluminum tablet marked "295 CAPE VINCENT"	293.425
Threemile Bay, Baptist church; in southeast corner of foundation wall; aluminum tablet marked "266 CAPE VINCENT"	264.544

Threemile Bay via St. Lawrence to Clayton.

St. Lawrence, 225 feet north of crossroads; on east side of road; on large bowlder; bronze tablet marked "357 CAPE VINCENT"	356.269

Clayton via Lafargeville to Theresa.

Clayton, the Barker (brick) building, on the north side of Water street; in limestone water table on the west side 1.85 feet northerly from the southwest corner of building; the said corner being 60 feet easterly from the point, where the east line of James street, projected, would intersect the north line of Water street; aluminum tablet marked "257 CAPE VINCENT"	256.248
Lafargeville, Orleans Hotel (stone building) in southeast corner of; aluminum tablet marked "381 CAPE VINCENT"	380.451
Theresa, stone high school on Main street; in water table in north face and near northwest corner of belfry tower; aluminum tablet marked "376 CAPE VINCENT"	375.915

Theresa via Redwood and Browns Corners to Alexandria Bay.

Redwood, "The Dollinger House" (hotel); in east side and near northeast corner of foundation wall of; aluminum tablet, marked "365 CAPE VINCENT"	364.786
Alexandria Bay, Reformed church; 29.9 feet north-northeast from the northwest corner of; in ledge in church lot; aluminum tablet marked "283 CAPE VINCENT"	282.267

Lafargeville via Omar to Fisher's Landing.

	Feet.
Omar, 420 feet northerly from intersection of Fishers Landing and Collins Landing roads; in bed rock on sandstone ledge, west side of the Collins Landing road, and on a line with northerly side of the Omar schoolhouse and distant 51.62 feet from the northwest corner of the schoolhouse; bronze tablet marked "297 CAPE VINCENT"	295.745
Fishers Landing, crossroads near; 72.6 feet from the south corner of Mrs. Tom's residence and 131 feet northwest of the west corner of a house on the opposite side of the road; top of a round-headed one-fourth inch brass bolt cemented into bed rock 6 inches below the surface of ground. The letters "U. S. P. B. M. 29" are cut in the bed rock. This is a bench mark set by the Deep Waterways Commission.	274.351

Redwood via South Hammond to Chippewa Village.

Chippewa Village; stone schoolhouse, district No. 11, 1 foot easterly from the northeast corner of; set in bed rock; bronze tablet marked "289 CAPE VINCENT"	287.768
Chippewa Village; stone schoolhouse, district No. 11, north face of northeast corner; center punch mark of brass bolt, being permanent bench mark C. V. of the Deep Waterway Commission	290.698

Limerick to Dexter.

Dexter, brick schoolhouse at; 2 feet easterly from northwest corner of main building; in limestone water table on northerly side of; aluminum tablet marked "326 CAPE VINCENT"	324.395

Limerick via Brownville to Watertown.

Brownville, brick schoolhouse at 5 corners; midway of front face of building and 3.2 feet above surface of ground, in limestone foundation wall; bronze tablet marked "355 CAPE VINCENT"	354.243
Watertown, Arsenal street; State armory, front face; west end; aluminum tablet marked "479 CAPE VINCENT"	478.087

Brownville via Sanford to Felts Mills.

Felts Mills, bridge over branch of Black river at; on east end of south abutment (Island abutment); bronze tablet marked "583 CAPE VINCENT"	582.456

JEFFERSON, LEWIS, OSWEGO AND ONEIDA COUNTIES.

Boonville No. 114, Carthage No. 100, Highmarket No. 101, Orwell No. 90 and Taberg No. 102 Quadrangles.

The elevations in the following list are based upon the Grist-Mill bench mark near Albany, the elevation of which is accepted as 13.863 feet above sea level. The initial points upon which this group of levels depends are bench marks along the precise level line Remsen to Limerick, herein reported, and a bench mark of the Deep Waterway Board at Rome. The elevations accepted for these accord with the 1903 adjustment by the U. S. Coast and Geodetic Survey.

The leveling on the Boonville quadrangle was done in 1901 under the direction of Mr. J. H. Jennings, topographer, by Mr.

A. S. Havens, levelman, and that on the other above mentioned quadrangle was done in 1902 by Mr. James B. Maguire, levelman.

All permanent bench marks dependent on this datum are marked with the letters "ALBANY" in addition to the figures of elevation and in some cases the year.

Boonville, along public road and Black River Canal via Leyden, Stokes and Frenchville to Remsen.

	Feet.
Boonville; canal lock No. 71 at R. R. station; west wall, top of south end of; bronze tablet marked "1121 ALBANY 1900"	1,121.306
West Leyden, steel bridge over Mohawk River, east abutment, top of north end of; bronze tablet marked "1493 ALBANY 1901"	1,493.500
(Line continued south from West Leyden.)	
West Branch, steel bridge over west branch of Mohawk river, south abutment, top of east end of; bronze tablet marked "1002 ALBANY 1901"	1,001.800
(Line continued northeast.)	
Delta, steel bridge over Mohawk river, north of state dam; east abutment, top of north end of; bronze tablet marked "516 ALBANY 1901"	516.160
Westernville, canal lock No. 16, in top of west wall, north end; copper bolt	587.580
(Line follows canal.)	
Frenchville, canal lock No. 117; west wall, top of north end of; copper bolt	595.473
(Line leaves canal here.)	
Frenchville, steel bridge over creek, south abutment, top of west end of; aluminum tablet marked "593 ALBANY 1901"	593.300
(Line follows creek road to east, then road to left.)	
Steuben Corners, church on northwest angle of crossroad, in south foundation wall of, near southeast corner; aluminum tablet marked "932 ALBANY 1901"	932.280
(Line follows this road east.)	
Remsen, north end of retaining wall between lower mill dam and R. W. & O. R. R., track, on face of coping stone; bronze tablet marked "1172"	1,172.464
Lowville, 1,000 feet south of railway station; west side of north abutment of railroad bridge; bronze tablet marked "863 ALBANY"	864.512
Gardners Corners, about 5.2 miles east of; northwest corner of foundation of school No. 14 in Martinsburg Township; bronze tablet marked "1700 ALBANY"	1,700.643
Gardners Corners, northwest corner of postoffice and general store; bonze tablet marked "1697 ALBANY"	1,697.560
Copenhagen, highway bridge over Deer river at; in north wing of west abutment; aluminum tablet marked "1174 ALBANY"	1,174.462
Champion, 400 feet south of crossroads at; west wall of culvert; bronze tablet marked "1011 ALBANY"	1,010.791
Carthage, iron railway bridge over Black river at; east end of south wing wall of east abutment; bronze tablet marked "741 ALBANY"	742.148

Glenfield west along Glenfield and Western Railroad, tramway, trail and highway to Clemens Corners.

(The error distributed in this line is excessive.)

	Feet.
Houseville, .34 mile south of crossroads at; in northeast corner of the south abutment of highway bridge; aluminum tablet marked "1304 ALBANY"	1,304.024
Page & Fairchild's Lumber Co., at upper end of tramway, in the north foundation wall of Camp No. 6; bronze tablet marked "2003 ALBANY"	2,002.641
Mill at entrance to trail in woods, 250 feet north and 150 feet west of; in bowlder; bronze tablet marked "1778 ALBANY"	1,777.526
School No. 4, Osceola township in the northwest corner of foundation wall; aluminum tablet marked "1591 ALBANY"	1,590.955

Greensboro east along road to Gardners Corners.

Oswego-Lewis county line, .25 mile north of; in large bowlder on northwest side of road; aluminum tablet marked "1696 ALBANY"	1,695.582
Gardners Corners, 5.8 miles southwest of; Jesse Marcellus farm, southeast corner of; 10 feet west of fence and 325 feet north of creek at the Culpepper road, in bowlder; bronze tablet marked "1758 ALBANY"	1,756.827

Greensboro west along road via Smartville to Altmar.

Greensboro, on State road at postoffice in face of east wall of culvert; bronze tablet marked "1269 ALBANY"	1,268.538
Orwell, northwest corner of crossroads; northeast corner of foundation of public fountains; bronze tablet marked "810 ALBANY"	809.587

Altmar south along R. W. & O. R. R. to Rome.

Altmar, southeast corner of foundation of Union Free school; aluminum tablet marked "557 ALBANY"	576.806
Kasoag, 500 feet east of R., W. & O. R. R., northwest corner of foundation of postoffice; aluminum tablet marked "638 ALBANY"	637.817
Williamstown, in west foundation wall of freight depot at; bronze tablet marked "603 ALBANY"	602.550
West Camden, 150 feet east of railroad, in northwest corner of foundation of Foster's general store; bronze tablet marked "542 ALBANY"	541.784
Camden, southwest corner of the water table of the town hall; aluminum tablet marked "520 ALBANY"	519.966
Blossvale, I. J. White's general store, opposite station; in southeast corner of foundation; aluminum tablet marked "420 ALBANY"	420.230
Rome, Deep Waterway bench mark; .5 mile west of; near the Beet Sugar Co.'s buildings; southeast corner of masonry of bridge of the R., W. & O. R. R. crossing highway, about 1 foot below top of rail	432.747

Camden northeast along road to Clemens Corners, thence northwest to Greensboro.

Florence, at intersection of State road and road to Osceola, southwest corner of the foundation of O'Mara's general store; bronze tablet marked "974 ALBANY"	973.826
Osceola, southwest corner of foundation of general store and postoffice; aluminum tablet marked "1033 ALBANY"	1,032.970
Clemens Corners, in northwest corner of foundation of School No. 4; aluminum tablet marked "1591 ALBANY"	1,590.955

Blossvale northeast along road to West Leyden.

Point Rock, in northwest corner of foundation of postoffice and general store; bronze tablet marked "1017 ALBANY"	1,016.596

	Feet.
West Leyden, about 4 miles west of; in Point Rock, West Leyden road, in north wall (facing road) of Jacob Kirk's house; bronze tablet marked "1493 ALBANY"	1,492.340

Greensboro via highway to School No. 7, Lorraine Township (single spur line).

School No. 7, Lorraine township, Jefferson county, west side of Greensboro-Lorraine road, in large bowlder; aluminum tablet marked "1262 ALBANY"	1,261.160

From Altmar, 3 miles northeast of, southeast to Ricard.

Ricard, .5 mile north of post office; .1 mile south of Orwell-Williamstown township lines, in front face of foundation of Armstrong's house on west side of road; bronze tablet marked "759 ALBANY"	

BROOME, CHENANGO, CORTLAND, ONONDAGA AND MADISON COUNTIES.

Appalachin No. 86, Binghamton No. 96, Nineveh No. 107, Coventry No. 106, Greene No. 93, Harford No. 85, Cortland No. 84, Pitcher No. 94, Norwich No. 105, Morrisville No. 104, Cazenovia No. 93, Tully No. 83, Syracuse No. 82, Chittenango No. 92 and Oneida No. 103 Quadrangles.

The elevations published in the following list are based upon the "Grist Mill" bench mark near Albany, the elevation of which is now accepted as 13.863 feet above mean sea level. They result in part from leveling previously reported upon which has been readjusted in conjunction with the later work, to accord with the 1903 adjustment of the precise level net, and the combined results are presented in this list. The initial points upon which these levels depend are various bench marks along the precise level line in 1898 in the vicinity of Binghamton and Bainbridge, and also bench marks recovered by the State Engineer's level line of 1901 along the Erie canal between Higginsville and Syracuse.

The work in 1897 on the four quadrangles preceding the last one named in the above list was done under the direction of Messrs. W. M. Beaman, C. C. Bassett and A. M. Walker, topographers, by Mr. Clark Brown, levelman, and the remainder of the work on the Cazenovia and Chittenden, and work on the Morrisville and Oneida quadrangles was done in 1898-9 under the direction of Mr. Walker by Messrs. W. W. Gilbert and A. W. Gill, levelmen. The remainder of the work was done in 1900 under the direction of Mr. J. H. Jennings, topographer, by Messrs. C. H. Semper and W. E. Green, levelmen, except a short line from McDonough to Smithfield Flats by C. W. Marvin, levelman, and one from Harpersville to Lanesboro, Pa., by J. B. Maguire, levelman, in 1902.

All bench marks dependent on this datum are marked with the letters "ALBANY" in addition to the figures of elevation. Those set in 1897 were referred originally to Syracuse and are marked with the letter "S."

	Feet.
Union, north along highway via Maine to Nanticoke (single spur line).	
Maine, M. E. church, at northwest corner of; aluminum tablet marked "915 ALBANY"	916.700
Nanticoke, at north corner of house of Mrs. Mary Councilman, in foundation wall; aluminum tablet marked "1100 ALBANY"	1,101.044
Union, south along highway to Vestal Center (single spur line).	
Union, Union M. E. church, at southwest corner of; bronze tablet marked "830 ALBANY"	830.751
Vestal Center, 975 feet east of; in northeast corner abutment of iron highway bridge over Big Choconut creek; bronze tablet marked "985 ALBANY"	985.274
Kirkwood to Hawleyton (single spur line).	
Hawleyton, M. E. church, northeast corner of; bronze tablet marked "1277 ALBANY"	1,277.314
Binghamton to West Chenango (single spur line).	
West Chenango, Abbott M. E. church; in southeast corner of wall; bronze tablet marked "1387 ALBANY"	1,388.018
Binghamton north along Delaware, Lackawanna and Western Railroad to Lisle.	
Chenango Forks, Bridge No. 1, Utica Division, Delaware, Lackawanna and Western Railroad, in southwest pedestal stone; bronze tablet marked "899 ALBANY"	899.047
Barker Station; highway bridge; northwest corner of abutment of; bronze tablet marked "934 ALBANY"	934.192
Lisle, Schoolhouse No. 1, southeast corner of; bronze tablet marked "975 ALBANY"	975.166
Chenango Forks, northeast along Delaware, Lackawanna and Western Railroad to Oxford.	
Greene, Town Hall; in foundation stone under middle column; bronze tablet marked "923 ALBANY"	923.910
Brisbin, 500 feet west of station; in north end of east abutment of highway bridge over Chenango river; bronze tablet marked "927 ALBANY"	927.277
Oxford, Citizens Opera House; in southeast corner of; in foundation wall; aluminum tablet marked "982 ALBANY"	982.402
Afton along highway to Coventryville (single spur line).	
Coventryville, Wm. Lyman's store; 8 feet from northeast corner in foundation wall; aluminum tablet marked "1435 ALBANY"	1,435.291
Harpersville south along Delaware and Hudson Railroad to Lanesboro, Pa.	
Harpersville, 1,250 feet west of; iron trestle bridge No. 97, southwest corner of coping stone of abutment of; bronze tablet marked "1051 ALBANY"	1,049.041
Windsor, in south wall at southeast corner of foundation of Presbyterian church; bronze tablet marked "972 ALBANY"	972.917

	Feet.
State Line post office, 1 mile north of; east side of river road; east side of river; at school No. 14, Windsor township, in northwest corner of foundation of W. W. Watrous' house; bronze tablet marked "960 ALBANY"	961.147

Sidney northwest along New York, Ontario and Western R. R. to Norwich.

Guilford, Episcopal church; northwest corner; front face; aluminum tablet marked "1511 ALBANY"	1,511.722

Norwich north along Delaware, Lackawanna and Western R. R. to Earlville.

Norwich, County Court House on Broad street; southeast corner of foundation wall; aluminum tablet marked "1015 ALBANY 1900"	1,015.216
Galena, .1 mile north of; railroad culvert, east side of top of south abutment; bronze tablet marked "1029 ALBANY 1900"	1,029.542

Norwich northwest via Plymouth and Otselic to Georgetown Station.

Beaver Meadow, Methodist church; in north face of; bronze tablet marked "1484 ALBANY 1900"	1,483.869
Otselic, 500 feet east of hotel; iron highway bridge; west side of; on top of south abutment; aluminum tablet marked "1331 ALBANY 1900"	1,331.035

South Plymouth along highways via North and East Pharsalia and McDonough to Smithville Flats (single spur line).

East Pharsalia, southeast corner of wall to Chapel, 1,000 feet south of hotel; bronze tablet marked "1557 ALBANY 1900"	1,557.240
McDonough, Emmanuel Baptist church; 3 feet from southeast corner of; in east foundation wall; aluminum tablet marked "1418 ALBANY"	1,418.666
Smithville Flats, in stone foundation of Presbyterian church; 1 foot west of southeast corner of; bronze tablet marked "1033 ALBANY 1902"	1,033.997

Lisle north along highway to Cincinnatus.

Willett, Hotel Ingall; southeast corner of foundation wall of; bronze tablet marked "1039 ALBANY"	1,039.527
Cincinnatus, in northeast corner of brick building of J. W. Osgood, opposite hotel; bronze tablet marked "1045 ALBANY"	1,044.756

Cincinnatus northeast along highway to Otselic.

North Pitcher, post office; west side of highway in foundation wall; bronze tablet marked "1166 ALBANY"	1,166.612

Pitcher north to Lincklaen (single spur line).

Lincklaen, First Congregational church; at west corner of; in front wall; bronze tablet marked "1192 ALBANY"	1,192.683

Lisle northwest along Delaware, Lackawanna and Western Railroad to Ithaca Junction.

(The error distributed in this line is excessive.)

Marathon, Peck Memorial Library, 1.5 feet from northwest corner of; in water table; bronze tablet marked "1019 ALBANY"	1,019.821
Blodgett Mills, 1,000 feet north of station; on west side of track in retaining wall; bronze tablet marked "1086 ALBANY"	1,086.336

Messengerville west along highway to Virgil (single spur line).

Virgil, M. E. church, in northeast corner stone; bronze tablet marked "1421 ALBANY"	1,421.249

Cortland southeast along Erie and Central New York Railroad via Solon to Willett.

	Feet.
Solon, Wm. Corcoran's house, in northwest corner wall of; bronze tablet marked "1308 ALBANY"	1,308.000

Cortland along Lehigh Valley Railroad to Cuyler.

Truxton, M. E. church, at corner of; bronze tablet marked "1159 ALBANY"	1,159.096
Cuyler, .25 mile east of; 500 feet east of north and south road; 4 feet south of track in bowlder; copper bolt marked "1256 S."	1,257.305

Ithaca Junction north along Delaware, Lackawanna and Western Railroad to Tully.

Cortland, State Normal school building; set in north side of east entrance; aluminum tablet marked "1122 ALBANY"	1,121.835
Preble, Presbyterian church; in southeast corner of wall; bronze tablet marked "1212 ALBANY"	1,212.554

Syracuse via Onondaga Valley, Cardiff and Tully to Summit.

Syracuse, at weigh lock, canal collector's office at right of west entrance door; in water table; bronze tablet marked "404 S"	404.320
Syracuse, Geddes street bridge No. 90, State Engineer bench mark No. 305, pier at foot of west towpath stairs at southwest corner of stairway landing; copper bolt	406.230
East Onondaga, northwest wing of bridge over Onondaga creek; in coping of; copper bolt marked "S 422"	422.129
Onondaga Indian village, .25 mile south of road leading to South Onondaga, 900 feet south of cemetery and 40 feet south of small brook in bowlder 3 feet from west road fence; copper bolt marked "S 469"	468.705
Cardiff, ⅛ mile east of road back of hotel; 75 feet south of brook; bowlder 6 feet broad and 2 feet high; copper bolt marked "S 676"	676.192
Tully Valley, south end of; 700 feet north of road west of Vesper; 500 feet south of curve in road; in bowlder in southwest corner of barnyard, west side of road; copper bolt marked "S 819"	819.617
Tully, 200 feet north of Hotel Slayton; in water table of brick house on west side of road; at southeast corner; front of house; bronze tablet marked "1251 S"	1,251.670

Summit north via Onativia to Jamesville.

Summit, 1 mile north of; on road to Syracuse, 500 feet north of white house on west side of road; 125 feet north of road summit; copper bolt in bowlder marked "1292 S"	1,292.510
Jamesville, .75 mile south of; at east end of reservoir dam, in coping; cross mark on bronze tablet marked "S 645"	645.493

Summit via Apulia and Fabius to Delphi.

Fabius, 100 feet west of crossroads, Main and Cemetery streets; in wall west window of flat-roofed frame house; bronze tablet marked "1284 S"	1,284.670

Delphi via Oran, Manlius and Jamesville to Syracuse.

Oran, 300 feet west of church, 20 feet north of road; in prominent bowlder; copper bolt marked "S 793"	793.678
Manlius, 1.5 miles northwest of; at High Bridge; double arch bridge over Limestone creek; in coping 5 feet from end of southwest wing; copper bolt marked "S 507"	507.550

	Feet.
Fayetteville to Erie Canal.	
Erie Canal, Limestone creek aqueduct; southwest coping parapet on west wing, towpath side; State Engineer bench mark, No. 286; copper bolt	434.207
Cuyler via Deruyter to Deruyter Reservoir.	
Cuyler, .25 mile east of; 500 feet east of north and south road, 4 feet south of Lehigh Valley Railroad track, in bowlder; copper bolt marked "1256 S."	1,257.305
Cuyler, .25 mile south of; 500 feet east of north and south road, 4 feet south of Lehigh Valley Railroad track in same bowlder as described in last above; railroad bench mark No. 86, iron bolt	1,257.510
(Spur line.)	
Deruyter, foundation of water tank, in coping side next to railroad track; iron bolt	1,284.70
Deruyter reservoir dam, west end of dam, south parapet of spillway arch, east end, face corner of coping; copper bolt marked "1286 S"	1,286.618
Deruyter via Sheds Corner and Georgetown to Erieville.	
Deruyter, 2.5 miles north of; .5 mile east of railroad bench mark No. 92, Reservoir road, opposite old sawmill; railroad culvert; south parapet; iron bolt set in lead	1,319.110
Sheds Corner station, railroad bench mark No. 94; 600 feet south of Tioughnioga creek railroad bridge, north abutment, west end, parapet; iron bolt set in cement	1,386.053
Sheds Corner station, 600 feet south of; railroad bridge over Tioughnioga creek; bridge seat; west end; south abutment; copper bolt marked "1383 S"	1,383.360
Georgetown, 1.5 miles west of; on road to Sheds Corners, 75 feet north of road to Erieville, 20 feet north of brook, 15 feet west of road; 4 feet east of road fence; iron bench mark post marked "S 1538"	1,538.754
Erieville via Nelson, Fenner and Cazenovia to Oran.	
Erieville reservoir gatehouse, 6 feet west of door; in projection of bottom course; copper bolt marked "1473 S"	1,474.117
Fenner, 1 mile south of, 1,000 feet north of Peterboro to turnpike; 150 feet south of orchard; 75 feet west of road, in outcrop; copper bolt marked "1466 S"	1,467.544
Cazenovia, 942 feet south of Lehigh Valley Railroad station; railroad bench mark No. 103; iron pin in northwest corner of north abutment	1,187.713
Cazenovia, chapel building of seminary; water table under pilaster at east side of door; south entrance of chapel; cross mark on bronze tablet marked "S 1246"	1,247.392
Canastota via Perryville, Fenner, Peterboro, Morrisville and Rome, Watertown and Ogdensburg Railroad, Higginsville and Happy Valley.	
Canastota, .5 mile south of New York Central and Hudson River Railroad station; in coping culvert (Lehigh Valley Railroad, bench mark 118), iron bolt	457.406
Cotton station, Lehigh Valley Railroad bench mark No. 114; .4 mile southwest of culvert; for farm crossing in north side of track; iron bolt in coping	758.016
Perryville crossroads; new schoolhouse on site of old church; corner to right of front entrance in stone foundation; tablet marked "1103 ALBANY"	1,103.431
Fenner, 1 mile south of; 1,000 feet north of Peterboro turnpike; 150 feet south of orchard; 75 feet west of road; in outcrop; copper bolt marked "1466 S"	1,467.544

	Feet.
Peterboro, schoolhouse side 15 feet from rear corner; in stone foundation; tablet marked "1320 ALBANY"	1,321.183
Morrisville, county jail; front; 7 feet from west corner; in stone foundation; tablet marked "1325 ALBANY"	1,326.259
Munnsville, Dexter and Davis' building used as store and post office; in south side of stone foundation of; 15 feet east of southwest corner of; aluminum tablet marked "679 ALBANY"	679.661
Durhamville, State Engineer bench mark No. 258, west road bridge canal (iron bridge) in southeast corner of third step; east wing of towpath abutment; copper bolt	432.594
Durhamville, State Engineer bench mark No. 257; east road bridge over canal; in southwest corner of third step; west wing of towpath abutment; copper bolt	433.716
State Bridge, State Engineer bench mark No. 254; road bridge over canal; southeast corner of second step; east wing of towpath abutment; copper bolt	432.579
State Bridge, State Engineer bench mark No. 253; .6 mile east of; road bridge over canal; southeast corner of second step; east wing of towpath; copper bolt	432.510
Higginsville, State Engineer bench mark No. 247; east road over canal; southeast corner of third step; east wing of new towpath abutment; copper bolt	433.274

Morrisville via West Eaton and Georgetown station to Georgetown.

West Eaton, schoolhouse front; right of entrance; 1 foot from corner; in stone foundation; tablet marked "1395 ALBANY"	1,395.673

Georgetown station east to Earlville thence north to Pine Wood.

Georgetown station; 1.75 miles southeast of; 10-foot span bridge; stream right east abutment; north end; 2.5 feet below top of tier; in abutment; iron bolt	1,493.92
Lebanon, store 50 feet north of station, east of street; in foundation wall near southwest corner; tablet marked "1346 ALBANY"	1,345.997
Earlville, in brickwork of schoolhouse; 1 foot to right of front door; tablet marked "1100 ALBANY"	1,100.295
Hamilton Bank building; in water table at northeast corner of bank building, 2 feet west of corner; aluminum tablet marked "1126 ALBANY"	1.126.038
Bouckville, stone building occupied by Coe and Brockett's store, in north side of; 2 feet above ground; 1 foot west of northeast corner; aluminum tablet marked "1149 ALBANY"	1,149.634

CAYUGA, ONONDAGA, TOMPKINS, CHEMUNG AND TIOGA COUNTIES.

Waverly No. 67, Owego No. 76, Ithaca No. 66, Dryden, No. 75, Moravia No. 74, Auburn No. 64 and Skaneateles No. 73 Quadrangles.

The elevations in the following list are based upon the Greenbush "Grist Mill" bench mark near Albany, the elevation of which is now accepted as 13.863 feet above mean sea level. They are in part the result of leveling previously reported but which has been readjusted and is published herewith with elevations corrected to accord with the 1903 adjustment of the precise level net through connections principally at Wellsburg, Waverly and

Owego. Leveling done by the Lehigh Valley Railroad was employed extensively in the readjustment.

The old leveling on the Waverly, Owego, Ithaca and Dryden quadrangles was done under the direction of Mr. R. D. Cummin, topographer, by Mr. W. W. Gilbert, levelman; the work on the Auburn, Skaneateles and Moravia quadrangles was done in 1896 under the direction of Mr. J. H. Jennings, topographer, principally by Mr. A. B. Pomme, levelman; and the new work on the Owego, Dryden and Harford quadrangles was done in 1900 under the direction of Mr. Jennings, by Mr. Wm. Kelley, levelman.

The permanent bench marks are marked by the letters "ALBANY" or letter "A" in addition to the figures of elevation, mostly one foot less than present accepted elevations except those set in 1896 which were marked with figures of elevation which were mostly from one to three feet more than the values now accepted.

	Feet.
Erie Railroad Bridge No. 37, 2.2 miles west of Owego to Owego thence northerly along railroad to Gridleyville.	
Owego, courthouse; in northwest corner of foundation wall; aluminum tablet marked "818 ALBANY"	818.387
Gridleyville, .3 mile south of; bridge No. 10, in northeast pedestal stone; bronze tablet marked "919 ALBANY"	919.464
Owego south along highway to Gibsons Corners.	
Kile, triangulation station, 2.8 miles south of Owego, on top of stone monument	1,280.349
Gibsons Corners, 1.5 feet from south end of schoolhouse; in west side wall; bronze tablet marked "1531 ALBANY"	1,531.558
Railroad Bridge 1.3 miles north of Owego along railroad and highway via Flemingville to Speedsville.	
Weltonville, highway bridge, southwest corner of south abutment; bronze tablet marked "930 A"	931.136
Flemingville via Lehigh Valley Railroad to point ¼ miles south of Dryden.	
Newark Valley, 900 feet south of station; at northwest corner of iron bridge No. 299 A, on abutment; bronze tablet marked "961 A"	961.634
Berkshire, M. E. church; at north side of west of front entrance; bronze tablet marked "1055 A"	1,055.658
Harford, Harford M. E. church; in north front of; aluminum tablet marked "1196 A"	1,195.861
Spencer south of Halsey Valley (single spur line).	
Halsey Valley, Dr H. P. Vosburgh's house, in northwest corner of; bronze tablet marked "1065 ALBANY"	1,065.618
Wellsburg via Lowmanville and North Chemung to Breesport.	
Breesport, county buildings; on west face of foundation of brick structure, 3 feet above ground and 25 feet south of the northwest corner, between second and third cellar windows therefrom; aluminum tablet marked "A 1160"	1,160.58

	Feet.
Swartwood, residence of Benjamin Barnes; center of foundation, north wing front of house; aluminum tablet marked "A 1054"	1,054.479
Van Etten to Wilseyville via Spencer.	
Spencer, southwest corner of Main and Tioga streets; in water table on north side of Fisher block, 1 foot east of northwest corner; bronze tablet marked "A 995"	995.395
Wilseyville to Besemers.	
Wilseyville, 2.25 miles north of; Delaware, Lackawanna and Western Railroad bridge over highway; south abutment under west rail and 2.5 feet above ground; aluminum tablet marked "957"	958.25
Besemers to Caroline via Slaterville Springs.	
Slaterville Springs; town clerk's office, east side of building; near northeast corner; 3 feet above ground; aluminum tablet marked "A 1120".	1,121.400
Caroline to Speedsville via West Owego Creek.	
Speedsville, O. F. Freeland's store; west side of building, 8 feet north of southwest corner, in top course of masonry foundation; aluminum tablet marked "A 1121"	1,121.939
Caroline to Etna via Dryden Lake and Dryden.	
Dryden, Southworth Library building, in foundation course of masonry, south front of structure; aluminum tablet marked "A 1090"	1,090.520
Varna to Besemers via Lehigh Valley Railroad and East Ithaca.	
Ithaca, Cornell University; civil engineering building, bottom course of foundation, south end of building; 5 feet east of southwest corner; aluminum tablet marked "A 814"	815.107
Cascade to Scipio.	
Scipio public school, 30 feet southeast of corner of; in bowlder; copper bolt marked "1205"	1,203.211
Scipio via Barbers to Levanna.	
Barbers Corners, 250 feet south of; in limestone bowlder on east side of road under apple tree near bridge; copper bolt marked "849"	847.934
Levenna to Union Springs. (The error distributed in this line is excessive.)	
Union Springs Sanitarium, basement door at south end of; in west end of doorsill; copper bolt marked "421"	418.680
Union Springs to Auburn.	
Half Acre railroad station, 1.25 miles southwest of; on stone near southwest corner of intersection of road to south; square chisel mark and figures "710"	706.764
Auburn post office building, Genesee street entrance; in top of wing stone at east end of steps; bronze tablet marked "710"	707.719
Union Springs to Cayuga.	
Cayuga, Cayuga and Seneca canal, lock No. 10; between anchors of west wing of south gate; copper bolt marked "392"	390.420
Auburn to Fleming and Scipio.	
Fleming, Methodist Episcopal church; in door step or water table; south door; copper bolt marked "912"	910.051
Throopsville to Cayuga.	
Throopsville, 1.75 miles east of; Lehigh Valley Railroad bench mark in foundation of culvert 201 feet north of point of switch; iron bolt	546.060
Skaneatelcs.	
State dam; in first step from top, west wing wall; copper bolt marked "870"	866.648

	Feet.
Skaneateles to Glen Haven, Route on west side of Lake.	
Owasco, .25 mile southeast of; on road to "Twelve Corners" in fifth foundation stone from south end of dry wall on east side of north approach to small iron bridge; copper bolt marked "853"	849.588
Kelloggsville, opposite road from "Twelve Corners;" west side of maple tree and scales in front of W. D. Sayles' store; copper bolt in bowlder marked "1424"	1,421.185
Marcellus station to Marcellus.	
Marcellus, Main street; stone arch over Otisco Lake outlet (Ninemile creek); in fourth coping stone east from angle at west end of north parapet wall; a little west of center; copper bolt marked "655"	651.221
Skaneateles to Borodino.	
Borodino, Thorn Hill road; 215 feet south of intersection of first road running east from; .5 mile north of; in sandstone bowlder on east side of driveway; copper bolt marked "1021"	1,017.634
Spafford, .5 mile south, in Bruce Norton's lot; 200 feet from fence on bank of small brook; east side of road; copper bolt marked "1654"	1,650.831
Wilsons Corners to Moravia.	
Moravia, "Moravia House," corner of Cayuga and Main streets, in northeast corner of foundation; bronze tablet marked "743"	740.480
Moravia to Cascade.	
Cascade Hotel, 1.25 miles northwest of; in limestone bowlder 10 feet southwest of bridge over small brook on road running north and south; copper bolt marked "1091"	1,088.284
Moravia to Peruville via Dresserville and M'Lean.	
Dresserville, George Fritz's saw and grist mill, in west end of door sill to south door of boiler house; copper bolt marked "1291"	1,286.68
Groton City, .25 mile north of; farm of George A. Bliss; 150 feet east of dwelling house and 125 feet east of road; copper bolt in bowlder marked "1372"	1,368.780
McLean, North street; east side of; 60 feet south of evergreen trees planted in graveyard on a straight line with road fence; in bowlder opposite upper part of graveyard; copper bolt marked "1234"	1,231.290
Bensons Corners, .33 mile south of; under most northerly of four butternut trees nearly opposite farm house; in bowlder in east fence; copper bolt marked "1320"	1,317.900
North Lansing, R. Beardsley's store, south of and close to building; iron post marked "1005"	1,001.986

MONROE, ONTARIO, WAYNE, SENECA, CAYUGA, ONONDAGA, OSWEGO, YATES, SCHUYLER, STEUBEN, CHEMUNG, AND TOMPKINS COUNTIES.

Oswego No. 62, Fulton No. 71, Baldwinsville No. 72, Weedsport No. 63, Clyde No. 57, Palmyra No. 51, Macedon No. 45, Rochester No. 40, Geneva No. 58, Phelps No. 52, Canandaigua No. 46, Genoa No. 65, Ovid No. 59, Penn Yan No. 53, Ithaca No. 66, Watkins No. 60, Hammondsport No. 54, Bath No. 48 and Corning No. 55 Quadrangles.

The elevations in the following list are based upon an aluminum tablet in the water table at the northeast corner of the post-office building at Oswego, N. Y., the elevation of which is now accepted as 295.753 feet above mean sea level in accord with the 1903 adjustment of the precise level net. The lists here presented are of old lines readjusted to accord with said adjustment.

The leveling was done in 1898-9 under the direction of Messrs. E. B. Clark, J. H. Wheat and J. H. Jennings, topographers, by Messrs. C. H. Semper, D. E. Baxter and W. F. Hammond, levelman. ,

All permanent bench marks dependent upon this datum are marked with the letters "OSWEGO" or the letter "O" in addition to the figures of elevation.

Charlotte to Oswego, along Rome, Watertown and Ogdensburg Railroad.

	Feet.
Charlotte, upper side of water table of old light-house at the south southeast angle east of the south window; United States Engineers' bench mark No. 1, chiseled circle	283.168
Sodus, Third M. E. church on Ridge road; at southwest corner of; in water table; aluminum tablet marked "457 O"	458.255
Red Creek, on Second street, Red Creek Academy; in stone foundation; 225 feet north of Rome, Watertown and Ogdensburg Railroad, on west side of street; aluminum tablet marked "355 OSWGO"	356.410
Hannibal, schoolhouse on Oswego street; in stone door sill of north entrance; aluminum tablet marked "354 OSWGO"	355.057
Oswego, 3.5 feet north of wharf line of south side of basin; 5 feet from east face of pier; old United States stone pier at foot of West Third street; top of iron bolt flush with top of masonry; marked "U S" + B M	251.898
Oswego, post office building, corner of Oneida and West First streets; water table northeast corner; aluminum tablet marked "295 OSWGO"	295.753
Webster, Union Academy; at northeast corner of building, in water table; aluminum tablet marked "465 OSWGO"	466.225
Fairport, Union School; in water table of Church; street front; aluminum tablet marked "498 OSWGO"	498.983

Ontario Center to Palmyra via Walworth.

Walworth, Walworth Academy; at northwest corner of building; water table; aluminum tablet marked "564 OSWGO"	564.785
Palmyra, 1 mile west of; Mud Creek Aqueduct; in buttress south wing west abutment; aluminum tablet marked "446 OSWGO"	446.625

Galloways Bridge northeast along highways to East Palmyra (single spur line).

East Palmyra, 2.3 miles southwest of; Falloway's highway bridge over Erie Canal; in east wing; tow path abutment; chiseled square	449.569
East Palmyra, Presbyterian church; in northwest corner of water table; bronze tablet marked "471 OSWGO"	471.826

Williamson to Marion (single spur line).

Williamson, Union Academy; northwest corner of building; aluminum tablet marked "454 OSWGO"	454.843
Marion, 500 feet north of Four Corners; Main street front of the Marion Collegiate Institute; aluminum tablet marked "462 OSWGO"	462.813

	Feet.
Wallington to Newark along Northern Central Railway.	
Fairville, brick schoolhouse; district No. 2, 475 feet west of Northern Central Railway, in masonry foundation; 7 feet south of front entrance; aluminum tablet marked "456 OSWGO"	456.802
Newark, southwest corner of Charles and Miller streets; Miller street front of Baptist church; 1 foot from northeast corner; in water table, aluminum tablet marked "457 OSWGO"	457.570
Oswego to Newport, via Fulton, Phoenix, Baldwinsville and Warners.	
Minetto, State dam, west side of Oswego river; southeast corner of third bulkhead pier on top of surface; aluminum tablet marked "302 A"	303.344
Minetto, 6.1 miles south of; L. S. B. M., No. 126, Oswego canal; on north hollow quoin between cinchers; copper bolt	329.025
Fulton, town hall; northwest corner; South First street; in water table; aluminum tablet marked "363 A"	364.542
Fulton, .5 mile south of; L. S. B. M. No. 125, Oswego canal, lock No. 8, on lower hollow quoin between cinchers; copper bolt	347.946
Phoenix, Bridge and Cherry streets; northwest corner of Union Academy, Cherry street front; water table; aluminum tablet marked "394 OSWGO"	395.020
Phoenix, canal bench mark; Oswego canal; in second step of abutment; south end; on Bridge street; copper bolt marked "364 A"	365.000
Phoenix, canal bench mark; Oswego canal; Guard Lock No. 1, in upper hollow quoin between cinchers; copper bolt marked "363 A"	364.400
Baldwinsville; southeast corner of Free Academy on Elizabeth street; aluminum tablet marked "423 OSWGO"	424.348
Warners, 700 feet east of crossroads; Mr. Hawley's brick dwelling; in east end of stone water table; aluminum tablet marked "477 OSWGO"	478.190
Newport, at Warners; Erie canal bench mark; southwest corner of hotel barn; 30 feet north of canal; chisel mark on bowlder	412.587
Fulton to Oswego, via Gilberts Mills, Palermo, Vermillion and South Scriba.	
Gilberts Mills, southeast corner of district school No. 5; aluminum tablet marked "435 OSWGO"	436.144
Vermillion, aluminum tablet on southeast corner of Methodist church on Main street; marked "422 OSWGO"	422.559
South Scriba, on north side of Hall road; in southeast corner of Ladies' Aid Society Hall; aluminum tablet marked "400 OSWGO"	401.517
Fulton to Peru, via Bowens Corners, Lysander and Plainville.	
Bowens Corners, south door of brick schoolhouse; district No. 5, stone door step; aluminum tablet marked "449 OSWGO"	449.603
Plainville, 300 feet west of four corners at center of town; north side of road; in top step of school house, district No. 5; aluminum tablet marked "403 OSWGO"	403.689
Peru, highway bridge over Erie Canal; towpath abutment; in west end of bottom step; N. Y. S. B. M. No. 324; copper bolt	413.643
Sterling station to Cato, along Lehigh Valley Railroad.	
Ira station; about 700 feet southwest of station; in northeast corner of water table of brick house; bronze tablet marked "430 OSWGO"	431.585
Cato, northwest corner of Main and North streets; southeast corner of water table of brick building; aluminum tablet marked "461 OSWGO"	462.811
Cato to Port Byron via Conquest.	
Conquest; .6 mile south of; east side of road; in front of brick house on south side; in water table; bronze tablet marked "449 A"	450.454

	Feet.
Port Byron, Lock No. 52; fourth step from west end of north side lock pier; copper bolt (N. Y. 352)	403.279
Port Byron, Lock No. 52; east hollow quoin south side of lock; head bolt marked "404 A"	406.005
At Clyde, Weedsport, and Montezuma (Set from State bench marks).	
Clyde, M. E. church on northeast side of Sodus street; in north end of foundation of front wall; aluminum tablet marked "406 OSWEGO".	405.196
Montezuma, Methodist church on Auburn street; in northeast corner of; in foundation masonry; bronze tablet marked "417 OSWEGO"	417.449
Weedsport, M. E. church on south side of Brutus street; in east end of foundation wall; in front face, bronze tablet marked "433 OSWEGO"	433.256
Newark south along Northern Central Railway to Phelps Junction southeast to East X.	
Phelps junction; 1.2 miles east of; on east end of stone abutment of aqueduct on south side of track; 15 feet from east end of wall; chiseled mark "U. S. G. S. B. M. 536"	536.82
Phelps, in southwest corner of schoolhouse on corner of Main and Banta streets; aluminum tablet set; marked "542 OSWGO 1899"	543.142
East X, on southwest corner of stone step of station house on Lyons and Geneva railroad; chiseled mark	478.65
Phelps Junction to Fairport along New York Central and Hudson River Railroad.	
Clifton Springs, 3.9 miles west of; Lehigh Valley overhead bridge abutment over Auburn branch of New York Central and Hudson River railroad; north abutment; bronze tablet marked "611 OSWGO 1899"	612.031
Farmington; in top of large boulder 500 feet south of station; bronze tablet marked "599 OSWGO"	599.596
Victor, 1,500 feet east of; in south end of east abutment of railway cattle pass; bronze tablet marked "559 OSWGO 1899"	560.099
Bushnells Basin; bridge No. 50 over Erie canal; towpath abutment inner fact to west wing; bronze tablet marked "465 OSWGO"	465.759
Phelps Junction via Stanley to Penn Yan, along the Northern Central Railway.	
Stanley; in northwest corner of grain elevator at railway station; aluminum tablet marked "903 OSWGO 1899"	904.027
Bellona, in southeast corner of Memorial Presbyterian church on Main street; aluminum tablet marked "731 OSWGO 1899"	732.207
Benton, in northeast corner of Methodist church; tablet marked "1089 OSWGO 1899"	1,089.814
Penn Yan to Himrods.	
Penn Yan, in front face of Penn Yan Academy; aluminum tablet marked "767 OSWGO 1899"	768.497
Milo Center, in east side of church on Main street; tablet marked "947 OSWGO 1899"	947.800
Himrods, 4.5 miles southwest of; small bridge .75 mile south of forks of road; in face of east wing north abutment; tablet marked "1111 OSWGO 1899"	1,112.490
Reading Center south along highway to Watkins.	
Reading Center, Baptist church; south side of; 4.5 feet from southeast corner of church; in fourth course of foundation stones from top; bronze tablet marked "1253 D"	1,253.894
Stanley to Canandaigua Lake.	
Rushville, in northwest corner of Methodist Episcopal church; in water table; tablet marked "870 OSWEGO"	871.063

Potter Center via Urbana to Hammondsport.

	Feet.
Potter Center, in east end of north abutment of iron bridge over Flint creek; tablet marked "893 OSWEGO 1899"	893.490
Branchport, 1,200 feet east of; in south end; west abutment of highway bridge road to Penn Yan; tablet marked "720 OSWEGO 1899"	720.702
Gibsons, 3 miles north of; in west end of north wall of iron bridge; aluminum tablet marked "733 OSWEGO 1899"	733.615
Urbana, in east side of wine cellar; tablet marked "734 OSWEGO 1899"	734.479
Hammondsport, .25 mile south of; in west end north abutment of bridge over inlet; tablet marked "718 OSWEGO 1899	718.662

Hammondsport via Bath to Savona.

Bath, in water table county clerk's office at left entrance; tablet marked "1103 OSWEGO 1899"	1,103.427
Savona, in south end; east abutment of highway bridge over Cohocton river; tablet marked "1050 OSWEGO"	1,050.708

Savona via Bradford and Tyrone to Reading Center.

Bradford, in top of south abutment; west end bridge; bronze tablet marked "1100 OSWEGO 1899."	1,100.442
Tyrone, in west end of south wall of highway bridge at gristmill; bronze tablet marked "1150 OSWEGO 1899"	1,155.231
Altay, 1,000 feet west of; in top of north wing east abutment highway bridge; bronze tablet marked "1213 OSWEGO 1899"	1,213.661

Savona via Erie Railway to Painted Post.

Painted Post; .8 mile west of: in southeast corner of open bridge on precise line; bronze tablet marked "935 DUNKIRK 1898"	936.195

Cooper via East Campbell, Monterey to Tyrone.

Monterey, 60 feet northwest of iron bridge; bronze tablet in bowlder; marked "1212 OSWEGO 1899"	1,212.778

North Rose via Lyons to Geneva.

Wayne Center, in southeast corner of schoolhouse on crossroads; bronze tablet marked "438 OSWEGO 1899"	438.942
Lyons, on west side of Broad street; between Church and Pearl streets; in Dutch Reformed church; bronze tablet marked "OSWEGO 437 1899"	438.395
Lyons, Water street highway bridge over canal; east wing of towpath abutment; chiseled square	407.727
Mitchell's, in north face wall of post office at railroad crossing; Junius post office; bronze tablet marked "491 OSWEGO 1899"	492.524

Geneva via Kendaia to Ovid.

Geneva, in west face of St. Peter's church; in water table; bronze tablet marked "481 OSWEGO 1899"	481.524
Varick, 1.8 miles south of; in northeast foundation stone of Lehigh Valley water tank, on west side of road; bronze tablet marked "562 OSWEGO 1899"	563.385
Kendaia; 40 feet east of railroad on highway; in northwest corner of foundation wall of grain elevator; bronze tablet marked "614 OSWEGO 1899"	614.856

Willard to Burdett.

North Hector, in masonry of basket factory; on crossroads; .5 mile south of station; .2 mile west of railroad; bronze tablet marked "840 OSWEGO 1899"	840.639
Burdett station, 4 miles north of; Lehigh Valley bench mark 313; in west end of south abutment of small bridge; iron bolt	940.582

	Feet.
Burdett station, 4 miles north of; in west end of south abutment of Lehigh Valley railroad bridge over small stream; 100 feet north of milepost 314; back of house of J. B. Erway on Lake road; copper bolt marked "939 D"	940.461
Wolcott; northwest corner of Main and Clyde streets; in masonry foundation southeast corner of Baptist church; aluminum tablet marked "378 OSWEGO"	379.026
South Butler, in northwest corner of schoolhouse on road east from hotel; bronze tablet marked "399 OSWEGO 1899"	399.717
Savannah, 6.6 miles south of; in south abutment; west wing; third step of May's canal bridge; May's Point; bronze tablet marked "396 OSWEGO 1899"	396.642
Seneca Falls, in south face wall of Mynderse Academy in north Park street; bronze tablet marked "465"	466.066

Seneca Falls via Ovid Center to Ithaca.

Barrytown, in northwest corner of Dutch Reformed church; bronze tablet marked "612 OSWEGO 1899"	613.223
Trumansburg, in south face of Union school and academy; bronze tablet marked "1000 OSWEGO 1899"	1,000.390

Ithaca north along road to Scipio.

Ludlowville, in south end of bulkhead dam; aluminum tablet marked "481 OSWEGO"	482.334
Genoa, Hotel Devitt; northeast corner of; in top of retaining wall; aluminum tablet marked "837 OSWEGO"	838.591
Venice Center; north side of hotel building; in foundation stone; aluminum tablet marked "998 OSWEGO"	999.600

Ludlowville northwest along road via Aurora to Levanna.

Black Rock; iron bridge over Paines Creek; west abutment in top of south wing; aluminum tablet marked "723 OSWEGO"	724.413
Aurora, Cayuga Military Academy; south door of basement; in west end of door sill; copper bolt marked "437 ft."	435.732

ONTARIO, YATES, STEUBEN, SCHUYLER AND CHEMUNG COUNTIES.

Naples No. 47, Bath No. 48, Owego No. 76 and Watkins No. 60 Quadrangles.

The elevations in the following list are based upon an aluminum tablet in the watertable of St. Mary's Home and School at Dunkirk as a reference datum. The elevation of this is now accepted as 598.937 feet above mean sea level.

The work on the Watkins quadrangle was previously reported but the elevations on that sheet are corrected and published in this list together with those by later work on the other quadrangles, to accord with the 1903 adjustment of the precise level net. They also accord with the corrected elevations in adjacent lists of this publication though the markings refer to different datums.

The leveling on the Watkins quadrangle was done in 1898 under the direction of Mr. R. D. Cummin, topographer, by Mr. W. W. Gilbert, levelman, and the later work was done in 1900 under the direction of Mr. J. H. Jennings, topographer, by Mr. W. E. Green, levelman.

All permanent bench marks dependent on this datum are marked with the letters "DUNKIRK" or the letter "D" in addition to the figures of elevation.

Horseheads to Watkins along Northern Central Railway.

	Feet.
Millport; highway bridge over Catharine creek at Millport House; in face of abutment at southwest corner of; bronze tablet marked "709 D"	710.627
Watkins, Schuyler county courthouse; in foundation at front; northwest corner; second course of stone from top; 3 feet south of corner; bronze tablet marked "476 D"	477.403

Burdett to Odessa along Lehigh Valley Railroad.

Burdett station; 600 feet south of; in north end of coping, west side of culvert under Lehigh Valley Railroad; copper bolt marked "1002 D".	1,003.437
Burdett station, Lehigh Valley bench mark 309; north end of coping, west end of culvert under Lehigh Valley Railroad; iron bolt marked "1002 D"	1,003.592
Burdett station, 1.37 miles south of; Lehigh Valley Railroad bench mark No. 307; in top course of west end of south abutment of Lehigh Valley Railroad bridge over intersection of highways; iron bolt marked "1018 D"	1,019.80
Burdett station, 3 miles south of; 150 feet north of milepost 307, Lehigh Valley bench mark 306, in top stone of east end of small culvert under Lehigh Valley Railroad; iron bolt marked "1040 D"	1,041.73
Burdett station, 4.12 miles south of; Lehigh Valley bench mark 305; in face of west abutment of highway bridge over Lehigh Valley Railroad, near north end of abutment; .12 mile south of milepost 306; iron pin marked "1059 D"	1,060.43
Odessa, 2 miles north of; Lehigh Valley bench mark 304; in top stone east end of culvert under Lehigh Valley Railroad; 450 feet south of milepost 305; iron bolt marked "1070 D"	1,071.01
Odessa, 1.12 miles north of; Lehigh Valley bench mark 303, in top stone east end of culvert under Lehigh Valley railroad; 250 feet south of milepost 304; iron pin marked "1077 D"	1,078.48
Odessa, .12 mile north of; Lehigh Valley bench mark 302; in coping west end of south abutment of Lehigh Valley Railroad bridge over highway; iron bolt	1,090.62
Odessa, 550 feet south of station; on west end of culvert under Lehigh Valley Railroad in face of coping near north end; bronze tablet marked "1053 D"	1,054.623

Townsend to Millport via Beaver Dams, Kendalls, Catlin Hill and Johnson Hollow.

Beaver Dams, house of David Beardsley, in foundation of; center of front; second course from top; aluminum tablet marked "1262 D".	1,263.179

Watkins station, Fall Brook Railway to Reading Center along highway.

Reading Center, Baptist church; in foundation south side, 4.5 feet from southeast corner; fourth course from top; bronze tablet marked "1253 D"	1,253.894

	Feet.
Burdett along Lehigh Valley Railroad toward Hector to a point 4 miles north of Burdett.	
Burdett station, 2.75 miles north of; Lehigh Valley bench mark 312, east side of water tank, north pier, west side of track; iron bolt marked "963 D"	963.81
Burdett station, 4 miles north of; in west end of south abutment of Lehigh Valley Railroad bridge over small stream, 100 feet north of milepost 314, back of house of B. J. Erway on Lake road; copper bolt marked "939 D"	940.461
Burdett station, 4 miles north of; Lehigh Valley bench mark 313; in west end of south abutment of bridge over small stream; iron bolt marked "939 D"	940.582
Rushville south along Railroad to Naples.	
Middlesex; brick schoolhouse, in water table of; bronze tablet marked "735 D"	735.642
Naples, Presbyterian church, in northwest corner of front; in water table; bronze tablet marked "799 DUNKIRK"	799.561
Naples, westward along highway via Hunts Hollow to Honeoye Lake.	
Pansy, .5 mile northwest of; at county line; west side of road, on north retaining wall of approach to Wm. S. Washburns' barn; bronze tablet marked "941 DUNKIRK"	941.698
Naples east along highway to Italy Hollow, thence north to Potter Center.	
Italy Hollow, M. E. church wall; bronze tablet marked "1121 DUNKIRK"	1,121.298
Hunts Hollow south along highway to Atlanta, thence along Erie Railroad to Bath.	
Atlanta; Presbyterian church; front wall; in water table of; bronze tablet marked 1317 DUNKIRK"	1,317.906
Avoca; M. E. church; on southwest corner of; bronze tablet marked "1191 DUNKIRK"	1,191.664
Kanona north along Kanona and Prattsburgh Railway to Prattsburgh, thence along highway to Italy Hollow.	
Wheeler, southeast corner of Frank Aull's house; in cellar wall; bronze tablet marked "1262 DUNKIRK"	1,262.845
Prattsburg; Presbyterian church; in front wall of; bronze tablet marked "1470 DUNKIRK"	1,470.637

ONTARIO, MONROE, GENESEE, WYOMING, LIVINGSTON AND STEUBEN COUNTIES.

Rochester No. 40, Phelps No. 52, Canandaigua No. 46, Honeoye No. 41, Wayland No. 42, Caledonia No. 35, Mt. Morris No. 36, Batavia No. 29 and Attica No. 23 Quadrangles.

The elevations in the following list are based upon various bench marks of the precise level net principally on the precise level line and south from Rochester to Hornellsville.

The leveling of 1899 on the Phelps and Canandaigua quadrangles was done under the direction of Mr. E. B. Clark, topographer, by Messrs. C. H. Semper and W. F. Hammond, levelmen; the work of 1901 on the Canandaigua, Honeoye, Caledonia and Mt. Morris quadrangles was done under the direction of Mr. J. H. Jennings, topographer, by Messrs. C. H. Semper and Wm. Kelley, levelmen, and the work of 1902 on the Batavia, Attica and Mt. Morris quadrangles was done under the direction of Mr. W. H. Lovell, topographer, by Mr. Geo. Baily, levelman.

The permanent bench marks set in 1899 were marked "OSWEGO"; and those set in 1901-2 were marked "ROCHESTER" in addition to the figures of elevation.

Genesee Valley Junction south along Erie Railroad to Mt. Morris.

	Feet.
Genesee, 60 feet east of Erie Freight house; 5 feet south of northwest corner of Delehanty's warehouse; in west face of foundation wall; aluminum tablet marked "602 ROCHESTER"	602.290

Stanley west along New York Central and Hudson River Railroad to East Bloomfield.

(The error distributed in this line is excessive.)

Ennerdale, 30 feet south of station building; south side of railroad, in east margin of highway in large bowlder; bronze tablet marked "851 OSWEGO"	851.393
Canandaigua; southwest corner of court house; in foundation wall; bronze tablet marked "766 OSWEGO 1899"	766.916
East Bloomfield; hotel, in southeast corner of; aluminum tablet marked "1017 OSWEGO 1899"	1,016.760

Wheelers south along highway via Braggville to Bristol Center (Single spur line).

Bristol Center; northwest corner of M. E. church; set in foundation wall of; bronze tablet marked "931 OSWEGO 1899"	930.898

Point 2 miles east of Canandaigua, south on east side of Canandaigua Lake (Single spur line).

Canandaigua, 7 miles south of; on Lake road; east side of Lake; south wall of bridge; in top of east end; bronze tablet marked "713 OSWEGO 1899"	713.594

East Bloomfield west along New York Central Railroad to Genesee Valley Junction.

(The error distributed as far as Honeoye Falls is excessive.)

Honeoye Falls, Union Free school; front face of north end; aluminum tablet marked "657 ROCHESTER 1901"	656.414
West Rush, 200 feet south of station; west face of hotel, in foundation stone; bronze tablet marked "571 ROCHESTER 1901"	570.282

Honeoye Falls south along highway to Livonia Center, thence west to Livonia.

Lima, St. Roses school on Rochester street, west face of north end; aluminum tablet marked "849 ROCHESTER 1901"	849.035
Livonia Center, Catholic church; front face southwest corner; bronze tablet marked "1093 ROCHESTER 1901"	1,092.415

Livonia south along Erie Railroad to Springwater.

Webster's crossing; Hill and Webster's general store; north face near northeast corner; bronze tablet marked "1363 ROCHESTER 1901"	1,362.428

Livonia Center south along railroad to Hemlock, thence southeast along highway to Honeoye.

	Feet.
Honeoye; Congregational church on Main street, in west face; bronze tablet marked "844 ROCHESTER 1901"	843.433

(This bench mark is on a short spur line not checked.)

Point 2 miles east of Hemlock, south along highway to Springwater.

Canadice, northwest corner of church sheds, at margin of roads; on large rock foundation; aluminum table marked "1569 ROCHESTER 1901"	1,568.855
Tabors Corners, school house; in west face; aluminum tablet marked "1863 ROCHESTER 1901"	1,862.338
Springwater; schoolhouse on road to station; in front face at northwest corner; aluminum tablet marked "970 ROCHESTER 1901"	969.707

Springwater southeast along Erie Railroad to Atlanta.

Atlanta; Presbyterian church; in water table of front wall; bronze tablet marked "1317 DUNKIRK"	1,317.906

Wayland westerly along Delaware, Lackawanna and Western Railroad to Mt. Morris.

Wayland, Lackawanna street school house; in west face; aluminum tablet marked "1372 ROCHESTER 1901"	1,370.722
Dansville, Delaware, Lackawanna and Western station; southeast corner of foundation; aluminum tablet marked "1024 ROCHESTER 1901".	1,022.980
Groveland; first crossing east of station; north side of Delaware, Lackawanna and Western railroad; in top of wall of cottage just east of steps; bronze tablet marked "601 ROCHESTER"	600.780

Avon along Erie Railroad via McQueens crossing to Livonia.

Avon, .57 mile south of station; on Bath Branch of Erie railroad; bridge over highway; south abutment; set in west end of; bronze tablet marked "609 ROCHESTER"	608.977
South Lima, at railroad station; cold storage building; southwest corner of foundation; bronze tablet marked "912 ROCHESTER 1901"	911.607

Avon west along railroad via Caledonia to Le Roy.

Caledonia depot, opposite; John Ball's storehouse; northerly face of foundation wall; set in; aluminum tablet marked "669 ROCHESTER"	668.399
LeRoy, crossing of Erie Railroad in; at southwest corner of church; set in easterly face; at northeast corner of Malthouse lettered "D"; bronze tablet marked "869 ROCHESTER"	868.385

Mt. Morris northwest along Delaware, Lackawanna and Western Railroad via Greigsville to Linwood.

Leicester; foundation wall of town hall; 12 feet from northeast corner of; set in easterly face; bronze tablet marked "661 ROCHESTER".	660.404
Craigs; 50 feet west of station; on north side of track; southwest corner of foundation wall of storehouse; set on southerly face near; bronze tablet marked "866 ROCHESTER"	865.988

Le Roy west along New York Central Railroad to Batavia.

Batavia; Attica Branch of New York Central; .5 mile from Batavia station; in northeast abutment of railroad bridge; bronze tablet marked "893 ROCHESTER"	892.386

Batavia south along New York Central and Erie Railroad via Attica to Warsaw.

Attica; .2 mile west of station; on south side of track of Erie Railroad bridge; in east abutment of; bronze tablet marked "990 ROCHESTER"	990.187

	Feet.
Dale station; .25 mile north of; railroad bridge over highway; in southeast abutment of; bronze tablet marked "1208 ROCHESTER".....	1,207.654
Warsaw; 1 mile north of; intersection with road north and south; 400 feet north of; in east wall of pipe culvert; aluminum tablet marked "1008 ROCHESTER"	1,008.684
Warsaw north along Buffalo, Rochester and Pittsburg Railroad via Pearl Creek, Pavilion Center and Delaware, Lackawanna and Western Junction to Le Roy.	
Pearl Creek; 800 feet north of station; southeast abutment of railroad bridge over creek; bronze tablet marked "954 ROCHESTER"......	954.333
Pavilion Center; 400 feet south of; bridge over highway in top of west end of north wall; bronze tablet marked "953 ROCHESTER"..........	953.237
Mt. Morris west along public road to Gibsonville (Single spur line).	
Mt. Morris, Scoville House; in door still at north side of front entrance; bronze tablet marked "627.144 ROCHESTER".............	627.144
Gibsonville; at road forks near old store; in bowlder sunk in ground; bronze tablet marked "726 ROCHESTER"........................	726.182

CATTARAUGUS AND ALLEGANY COUNTIES.

Redhouse No. 14, Salamanca No. 20 and Olean No. 26 Quadrangles.

The elevations in the following list are based upon an aluminum tablet in the brick schoolhouse No. 4 at Salamanca, marked "1391 D," the elevation of which is now accepted as 1,391.485 feet above mean sea level. This bench mark was set from the precise level line run in 1898 and replaces, at 0.01 foot higher position, the bronze tablet originally placed there.

The work here listed was previously reported upon but is here corrected to accord with the 1903 adjustment of the precise level net.

The elevation of this new tablet at Salamanca to accord with the datum of elevations marked on permanent bench marks of this list set in 1897 and derived from railroad data, is 1,396.140 feet. Thus bench marks set in 1897 were incorrectly marked with figures of elevation mostly 5 feet higher than the elevations now accepted, and for similar reasons the bench marks set in 1896 in the Olean quadrangle were mostly marked with figures of elevation 7 feet higher, the additional 2 feet coming from the readjustment of the railroad levels in the fall of 1896.

The leveling was done by Mr. E. L. McNair under the direction of Mr. Frank Sutton, topographer, in 1896, and under the direction of Mr. J. H. Jennings, topographer, in 1897.

The permanent bench marks set in 1897 were marked with the letter "S" and those set in 1896 were not marked save with figures of elevation as aforesaid.

	Feet.
Olean to Portville.	
Portville, Presbyterian church; in upper stone step at entrance; copper bolt marked "U. S. G. S. B. M. 1438 ft."	1,432.143
Olean to Hinsdale.	
Hinsdale, 1.5 miles south of Olean creek bridge; Faye Hollow highway, in capstone of bridge foundation; copper bolt marked "U. S. G. S. B. M. 1449 ft."	1,442.079
Hinsdale toward Ischua.	
Ischua Town, Hinsdale-Ischua road; in base of stone wall under barn of Harris Johnson, south side of barn, west side of road, in large flat stone; copper bolt marked "U. S. G. S. B. M. 1544 ft."	1,536.378
Portville via Clarksville to Cuba.	
Genesee Town, Portville-Clarksville road; near Obi, at Seventh Day Baptist church; 85 feet from church doors; 10 feet from center of road; 3 feet from fence, on land belonging to Mrs. E. B. Adams, in large flat rock on west side of road; copper bolt marked "U. S. G. S. B. M. 1547 ft."	1,539.910
Clarksville, M. M. Congdon's residence, in stone horse block; copper bolt marked "U. S. G. S. B. M. 1604 ft."	1,596.063
South Vandalia southward through Chipmunk Oil Fields.	
South Vandalia station, 3 miles south of; 55 feet south of road east and 140 feet north of M. Kelly's white house on west side of road; in bowlder 2 feet outside of fence on west side of road; copper bolt marked "1529 ft. S"	1,524.144
Carrollton via Limestone to New York and Pennsylvania State Line.	
Allegany river iron highway bridge; .83 mile south of; 4 miles north of Limestone, in large bowlder nearly buried in ground on west side of road, between it and ditch; pole bars entering pasture fields on each side of road; copper bolt marked "1410 ft. S"	1,405.718
Killbuck to Great Valley.	
Killbuck, 3.9 miles north of; at southwest corner of iron bridge across Wright's creek and about .25 mile above its junction with Great Valley Creek in stone abutment; copper bolt marked "1456 ft. S"	1,451.923
Great Valley to Humphrey.	
Humphrey, W. J. Sherman's hotel, in stone doorstep in front of porch; west side; copper bolt marked "1626 ft. S"	1,621.444

CHAUTAUQUA AND CATTARAUGUS COUNTIES.

Westfield No. 1, Silver Creek No. 6, Dunkirk No. 3, Cherry Creek No. 7, Clymer No. 2, Chautauqua No. 4 and Falconer No. 8 Quadrangles.

The elevations in the following list are based upon an aluminum tablet in the water table of St. Mary's Home and school at Dunkirk, the elevation of which is now accepted as 598.937 feet above mean sea level. A portion of the list here given is of work on the Westfield, Silver Creek, Dunkirk and Cherry Creek quadrangles previously reported upon, which is corrected and published in this list with later work in accord with the adjustment of 1903 of the precise level net.

The leveling of 1902 was done under the direction of Mr. A. C. Roberts, topographer, by Messrs. Wm. Kelley and G. M. Dimmick, levelmen, and the previous leveling was done under the direction of Mr. Frank Sutton, topographer, by Mr. E. L. Faison, levelman.

All permanent bench marks dependent on this datum are marked with the letter " D " or letters " DUNKIRK " in addition to the figures of elevation.

Chautauqua County, Westfield, Dunkirk, Cherry Creek and Silver Creek Quadrangles, Dunkirk to Fredonia, along Dunkirk, Allegany Valley and Pittsburg Railroad.

	Feet.
Dunkirk, extreme northwest corner of Nelson block, top of water table.	588.866
Fredonia to Westfield via Laona, Lillydale, Cassadaga, Stockton and Mayville.	
Laona, Dunkirk, Allegany and Pittsburgh Railroad, iron bridge over Canadaway creek, on west side of, in top stone, north abutment; bronze tablet marked "817 D"	817.926
Stockton, 500 feet west of Chrisses' Hotel, east side of blacksmith shop on Mayville street in stone foundation of, 4 feet above ground; bronze tablet marked "1316 D"	1,317.521
Mayville, east of town, west side of cemetery, highway bridge over Black Brook, in top stone east abutment, north end of; bronze tablet marked "1324 D"	1,324.865
Prospect, foundation of Western New York and Pennsylvania railway station; in northeast corner; bronze tablet marked "1213 D"	1,214.183
Westfield, in northwest corner of masonry foundation of public school building; 2.5 feet above ground; bronze tablet marked "748 D"	748.900
Westfield to Fredonia via Brockton.	
Brockton, 1 mile north of; .25 mile east of station; in south side of center pier of double arch (stone) of Lake Shore railroad over Slippery Creek; copper bolt marked "667 D"	668.518
Cassadaga to Cherry Creek.	
Charlotte Center, 640 feet east of road turning off south; in stone 12 feet north of road, 6 inches above surface of ground; copper bolt marked "1915 D"	1,915.887
Cherry Creek, in north abutment west side of iron bridge over Cherry creek; running east on Main street, copper bolt marked "1309 D"	1,310.51
Cherry Creek via Arkwright to Laona.	
Arkwright Center, .9 mile east of; 15 feet north of center of road; large stone in place; 2 feet above ground; copper bolt marked "1570 D"	1,571.006

Mayville southeast along Jamestown, Chautauqua and Lake Erie Railroad via Chautauqua Point to Jamestown.

	Feet.
Dewittville, southeast corner of foundation wall of Methodist church at; 7.5 feet west of in southern side; bronze tablet marked "1319 DUNKIRK"	1,319.864
Bemus Point, 440 feet south of depot; west side of Cemetery street, on the southerly side of A. G. Barrett's residence, in foundation wall of bay window; bronze tablet marked "1345 DUNKIRK"	1,345.529
Ellery Center, Cowden Bros. store; in foundation wall, north face; bronze tablet marked "1758 DUNKIRK 1902"	1,758.450

Jamestown southwest along Erie Railroad to Brokenstraw (Grant station), thence along highway north to Panama, thence west to North Clymer.

Jamestown, 3,750 feet west of; north end west abutment of Erie Railroad bridge over Chautauqua Outlet, in top step but one; bronze tablet marked "1324 DUNKIRK 1902"	1,324.462
Lakewood, post office, on east side of Chautauqua avenue; southwest corner of R. H. Maxim's building (post office) on south side, 4 feet east of; aluminum tablet marked "1362 DUNKIRK"	1,361.810
Panama, Hotel Berny, north face, east corner, in water-table; aluminum tablet marked "1551 DUNKIRK"	1,550.667
North Clymer, M. E. Church, south face, in foundation wall; bronze tablet marked "1582 DUNKIRK 1902"	1,582.091

Sherman station west to Sherman (Single spur line).

Sherman station, .72 mile west of; at Sherman village; highway bridge over Finch creek, north abutment west end; bronze tablet marked "1538 DUNKIRK 1902"	1,538.226

Clymer west along highway to Marvin, thence north to point 9 miles north of Findley Lake, thence indirectly eastward to point 3 miles west of Mayville.

Clymer, 1.3 miles west of Clymer station; Baptist church; west end, front face, in foundation wall; bronze tablet marked "1468 DUNKIRK 1902"	1,468.349
Marvin, .6 mile north of; highway bridge over Finch creek, north end, west abutment, top of; bronze tablet marked "1388 DUNKIRK 1902"	1,387.907
Findley Lake, Methodist church; in front face, west corner, in foundation wall; aluminum tablet marked "1429 DUNKIRK 1902"	1,428.655
Findley Lake, 9 miles north of; 1,000 feet south of Three Corners, in north abutment, east end of small bridge; bronze tablet marked "1293 DUNKIRK 1902"	1,293.049
Volusia, Methodist church; in front face, south side, foundation; bronze tablet marked "1557 DUNKIRK 1902"	1,556.785
Kennedy, Erie Railroad bridge, 750 feet south of station; east end of north abutment; bronze tablet marked "1257 DUNKIRK 1902"	1,257.358
Connewango, residence of Dr. J. R. Smith, north face, east end, in foundation wall; bronze tablet marked "1293 DUNKIRK 1902"	1,293.321
Cherry Creek, at southeast corner of brick block on Main street, 2 feet above ground, corner of water table	1,306.461

Falconer north along Dunkirk, Allegany Valley and Pittsburg Railroad to Gerry, thence along highway east to Ellington.

Falconer, 500 feet south of abutment; top of east end of north abutment of bridge; aluminum tablet marked "1258 DUNKIRK 1902"	1,257.717
Gerry, schoolhouse, district No. 1, in foundation wall, 9 feet from southeast corner, east face; bronze tablet marked "1309 DUNKIRK 1902"	1,308.729
Ellington, Congregational church, in north face east end, foundation wall of; bronze tablet marked "1360 DUNKIRK 1902"	1,379.945

GENESEE AND MONROE COUNTIES.

Brockport No. 34 and Hamlin No. 33 Quadrangles.

The elevations published in the following list are based on a bronze tablet set in the foundation of the Normal School at Brockport and marked "B 538." The elevation of this bench mark above mean sea level is derived from the nearest bench mark of the old State Canal Survey recovered by the 1901 line. As reduced in accordance with the 1903 adjustment, the height of this bench mark is accepted as 539.231 feet above mean sea level. The elevations marked on the bench marks of this list are mostly 1 foot lower than the elevations now accepted.

The leveling was done in 1897 under the direction of Messrs. J. H. Jennings and E. B. Clark, topographers, by Mr. E. L. McNair, levelman.

All bench marks dependent on this datum are marked with the letter "B" in addition to the figures of elevation.

	Feet.
Brockport to Hamlin.	
Brockport, Normal school; bronze tablet in foundation wall in front of office, marked "B 538"	539.231
Hamlin, Hamlin House, 6 feet from southwest corner of; iron post set in ground inside fence, marked "B 337"	337.707
Hamlin to Hilton.	
Hilton, house of Dr. J. J. Williams; bronze tablet set in foundation wall under bay window; marked "B 284"	285.259
Hilton to Spencerport.	
Spencerport, Amity street; Canal bridge No. 99; bronze tablet in center of abutment facing towpath and canal; marked "514 B"	514.749
Brockport to point 1 mile south of Sweden Center.	
Brockport, Erie Canal bench mark No. 107 (State Engineer B. M. No. 475) on lower step, east end, towpath abutment of Park avenue canal bridge	510.690
Sweden Center, 1 mile south of, at George H. Way's residence; bronze tablet in foundation wall under bay window; marked "639 B"	640.191
Bergen.	
Bergen, New York Central and Hudson River Railroad station, bronze tablet set in doorstep of baggage room, marked "604 B"	604.959
Southward from Chili Station (N. Y. C. R. R.).	
Chili station, 380 feet east of; bronze tablet set in south end of old culvert abutment at southwest corner of flagman's shanty, south side of main line New York Central and Hudson River Railroad; marked "561 B"	562.174
Chili station, 2½ miles south of, and 1¼ miles south of Buckbees Corners; bronze tablet in foundation wall under southeast corner of dwelling house of John Groves on west side of road; marked "558 B"	559.471
Churchville.	
Churchville, Union School building; bronze tablet at right side of main entrance, marked "615 B"	615.633
Churchville, New York Central and Hudson River Railroad station, 800 feet east of; west abutment New York Central and Hudson River Railroad bridge No. 721 (railroad company's bench mark)	564.57

ORLEANS, GENESEE, NIAGARA AND ERIE COUNTIES.

Medina No. 22, Albion No. 28, Lockport No. 16, Ridgeway No. 21, Oak Orchard No. 27 and Olcott No. 15 Quadrangles.

The elevations in the following list are based on a bronze tablet set in the front wall, east of door on Niagara street entrance to Niagara County Courthouse at Lockport, marked "616." The elevation of this bench mark above mean sea level is based on the nearest bench mark of the old State Canal Survey recovered by the 1901 line. As reduced in accordance with the 1903 adjustment the height of this bench mark is 615.183 feet. The leveling was done in 1896 under the direction of Mr. Frank Sutton, topographer, by Mr. E. L. McNair, now topographer.

The elevations in this list marked on the bench marks are mostly 1 foot too high.

	Feet.
Olcott and Lockport Quadrangles—Lockport north, on Olcott road 6.5 miles to Cemetery, thence east to Hess road, thence south to Ridge road, thence east to Hartland, thence south to Gasport.	
Newfane Town, on road running east and west between Lake and Hess roads, 3 miles north of Wrights Corners, District school No. 16, 30 feet southeast of, on granite bowlder; copper bolt marked "363 ft."......	362.466
Gasport, Erie Canal bridge No. 152; in east abutment, north end; copper bolt marked "521 ft."................................	520.256
Lockport southeast to Dysingers Corners, thence north to Orangeport.	
Lockport, Niagara county courthouse; in front of, east of main door; Niagara street entrance; bronze tablet marked "616".............	615.183
Dysingers Corners, William Dysingers' red barn, in southwest corner of foundation; bronze tablet marked "628 ft."......................	627.697
Pendleton Town.	
Pendleton Town, Sulphur Springs, guard lock bridge No. 168, in north end of east pier; copper bolt marked "582 ft."........................	581.160
Bench marks set from old railroad levels corrected, (accuracy doubtful).	
Transit, 700 feet west of railroad station; Batavia and Tonawanda Branch New York Central and Hudson River Railroad, bridge No. 119, south side of, in west abutment next to lower step; copper bolt marked "587"..	588.554
East Clarence, 2,400 feet east of; bridge No. 114, Batavia and Tonawanda branch New York Central and Hudson River Railroad, at south end, east abutment, coping stone; copper bolt marked "639"........	638.070
Ridgeway and Medina Quadrangles (on circuits tied to canal bench marks).	
Middleport, Erie Canal bridge No. 145; in north foundation; under center of bridge and facing towpath and canal; bronze tablet marked "519".	518.458
Jeddo, 153 feet from doorway of Adventist church; 50 feet from doorway of schoolhouse, in road corners in top of bowlder, 3.3 feet high; copper bolt marked "421"..	419.927
Medina, Prospect street bridge No. 140; lower step, east end, north side of Erie Canal; copper bolt marked "518"......................	517.189
Oak Orchard, iron bridge across Oak Orchard creek; 1,000 feet east of post office, 6 feet from southwest corner, in abutment; copper bolt marked "370"..	369.588
Eagle Harbor, Gaines Town, Erie Canal bridge No. 131; in lower step, east wing, towpath side; copper bolt marked "516"................	515.715

These elevations are determined from New York Survey levels of 1883, corrected.

	Feet.
East Shelby, at southwest corner of Methodist Episcopal church, in bowlder; copper bolt marked "668"	667.547
Shelby Town, Coons Bridge, 125 feet north of; east side of road between East and West Shelby, in top of bowlder 3 feet high; copper bolt marked "616"	615.756
Wheatville, 200 feet north of road crossing; 3 feet east of fence line, northwest corner of red barn on land of John Waterstreet, in granite bowlder under; copper bolt marked "669"	668.182
Alabama Town, north side of gate entrance to canal feeder, in second step; east abutment; copper bolt marked "622"	621.160

Bench marks set from old railroad levels corrected (accuracy doubtful).

Pembroke railroad station; 1,550 feet east of; on bridge No. 104, Batavia and Tonawanda branch of the New York Central and Hudson River Railroad; on coping stone of east abutment, south side of track; copper bolt marked "823"	822.780
East Pembroke, 1 mile north of; 630 feet north of corner, east side of north and south road; on land belonging to E. H. Clark, in bowlder 6 feet square deeply embedded in ground; copper bolt marked "873 ft."	872.140

Oak Orchard and Albion Quadrangles (on circuits tied to canal bench marks).

Albion, Orleans House, corner of Platt and Bank streets; 40.5 feet from Banks street corner, on Platt street side; 7.7 feet from office door; bronze tablet marked "521"	519.984
Fairhaven, 1,200 feet south of, on east side of road to Albion; in top of stone masonry wall in front of Mrs. Dixon's house; copper bolt marked "439"	438.206
Gaines Town, W. H. Banker's house on west side of Transit road; 600 feet north of Murray and Gaines Baptist church, 12 feet from dwelling, in stone 3 feet square, and 1.5 feet high; in door-yard, south side of dwelling; copper bolt marked "458"	457.114
Murray, 610 feet north of road crossing on west side of road, 81 feet southwest of stone schoolhouse, in bowlder 3 feet wide and 2 feet high; copper bolt marked "410"	409.458
Holley, Erie Canal bridge No. 115; Webster Warehouse, south and west of; on doorsill of only door on canal side; copper bolt marked "514"	513.210

(These elevations are determined from New York State Survey levels corrected.)

Clarendon Town, opposite Andrew Kuhn's house, on land belonging to Mrs. Butcher, .33 mile north of county line; in granite bowlder; copper bolt marked "648"	647.137
Elba Town, at southwest corner of junction of east and west road and road south. The east and west road is the first road north from Langdon Corners, and the north and south road is the first one turning north going east from Langdon Corners, in granite bowlder, 2.6 feet high; copper bolt marked "675"	674.637
East Oakfield, 1.5 miles east of; 65 feet southeast of schoolhouse, district No. 9, 15 feet from road corner on west side of north road, in bowlder; copper bolt marked "709"	708.143
South Barre. 220 feet east of; road crossing; in stone doorsill of district schoolhouse No. 9; copper bolt marked "652"	651.645
Barré Town, E. E. Allis' house, north side first road east, north of West Barre on road to Eagle Harbor, .75 mile east of north and south road, in lower of three stone steps of eastern front door; copper bolt marked "666"	665.304

Bench mark set from old railroad levels corrected (accuracy doubtful).

Byron, 1,710 feet west of railroad station; 27 feet north from center of New York Central and Hudson River Railroad Company's north track; in next to upper step of large culvert across Black creek; copper bolt marked "682"	681.165

Abstract of Instructions Relating to the Work of the United States Geological Survey

As Applied to the Cooperative Survey of the State of New York During the Year 1903. Topographic Branch.

COOPERATIVE SURVEY.

The character of the work and its degree of accuracy and precision are best indicated by the following "Abstract of Instructions," here reprinted from the official handbook, issued by the U. S. G. S. office at Washington, D. C.

ORGANIZATION.

1. The topographic branch of the U. S. G. S. is organized in two divisions: (a) topography, and (b) geography and forestry. In addition to these there is a triangulation and computing section. The chiefs of the sections constitute an advisory committee to the Director, to which matters pertaining to the topographic branch as a whole are referred. To this committee the chief of the triangulation and computing section and the custodian of instruments report.

PRIMARY TRIANGULATION.

1. Signals should be of sawed lumber whenever it can be obtained, and great care must be taken to secure perfect centering of instruments and target over station mark.

2. All stations should be selected with a view to their adaptability to topographic expansion, and when the exact location of a station is decided upon, one of the standard iron posts, copper plugs or bronze tablets must be set as a permanent mark. In light soil a bottle or similar object must be left as a subsurface mark. These marks should be exactly at the center of the station, and in addition there should be left one or more permanent reference marks.

3. Ends of base lines should be marked as follows:

(a) Station mark—A bronze or aluminum tablet, countersunk and cemented in center of top of a stone post at least 48 by 8 by 8 inches, set flush with surface of ground.

(b) Reference marks—Standard bench mark posts, set 42 inches in ground, at right angles to base, one on either side 20 feet distant, and one on prolongation of base 20 feet distant; also azimuths and distances to nearby permanent objects.

(c) If a stone post can not be obtained for a station mark, a bench-mark post may be used, but it must be set in a cubic yard of concrete and the top be stamped or lettered to distinguish it from the reference posts.

4. Whenever practicable, set the theodolite over the center of the station while reading angles to obviate reduction to center.

5. The theodolite when in use must be sheltered from the sun and wind. When setting the theodolite tripod, leave the headbolt thumbscrews loose until the legs are firmly placed.

6. Never, under any circumstances, attempt to place the circle so that when pointing at any particular station the micrometers will be set to even degrees.

7. Use Book 9–912 for all field records, and do not crowd notes. Have notes plainly written with No. 4 pencil or with ink, and never erase but draw a single line through erroneous records.

8. On the page immediately preceding the record of angles, write a minute and complete description of the station occupied, giving nearest trails or roads, camping places, station marks, etc., as well as ownership of land when possible. Write this description before leaving the station. In addition, plat a rough diagram of pointings, showing also plan of eccentric location of instrument, if there be such.

9. Before observations are commenced at a station, test all adjustments of theodolite and correct such as are found in error, paying special attention to micrometers to avoid the errors of run.

10. For micrometer theodolites, angles must be measured either by the method of circle readings (directions) or by single angles,

and in either case each set of angles must be kept on a single page of notebook. If the method of directions be adopted, each complete set must consist of pointings with telescope direct, and reverse pointings with telescope inverted, always closing horizon. See Monograph XXII for additional details in use of micrometer theodolites.

11. No angle should be considered finally determined that has not been measured on at least five different parts of the circle.

12. The error of closure of any triangle in primary schemes should not exceed 5 seconds.

13. Opposite each angle recorded give any necessary information in regard to visibility of signals or atmospheric conditions.

14. Do not trust to memory for notes. Make all notes as complete as though it were expected another person would compute them.

15. Observations for azimuth on Polaris before and after elongation must be made on two nights from at least two stations for each general locality of work, to consist of not fewer than six angles between mark and star with telescope direct and reversed. See Monograph XXII for form of record in reductions. Great care must be taken in adjusting and leveling the horizontal axis of the theodolite. Watch error must be determined by telegraphic comparison of time or by astronomic observation. The mark should consist of a small box with a slit about one-eighth inch wide and 6 inches long cut in it (having also ventilating holes), the box, with slit toward observing station, to be firmly nailed to stakes driven in the ground and at a distance from the station of at least a mile. At the time of observation a lamp or candle is to be placed in the box. The following day the angle between the mark and one of the triangulation stations should be measured in the usual manner.

16. Angles at each station must be reduced to center of permanent mark in the field in order to test triangle closures. Arbitrary adjustments and preliminary computations should also be made in the field. All computations, except distances and coordinates, must be in Book 9–889.

17. Keep a careful plot of the work on a scale of 10 miles to an inch, and each month send a copy with monthly report, indicating angles measured by the usual signs.

18. On fly leaf of each notebook write an index of contents of book, and state make and number of theodolite used.

19. The observer should always endeavor to locate prominent points that may be of use to the topographer, or that may be used for future stations.

20. Special attention must be paid to the location of county courthouses, section and county corners and State-line marks.

21. Useful locations can often be made by the "three-point method," the theodolite being set up for the purpose while going to or from stations.

22. Keep in view the fact that station names are to be published, and select such as have local significance.

PRIMARY TRAVERSE.

1. The instruments to be used are a 20″ or 30″ transit; one 300-foot steel tape graduated to feet for 5 feet at either end; one spring balance; one 100-foot steel tape; two thermometers; four hand recorders; two flagpoles and one good watch.

2. The party should consist of: One chief, as transitman; one recorder; two tapemen, either of whom may act as front or rear flagman; and one flagman.

3. At each station the transitman should proceed as follows: Set telescope on rear flag, read both verniers, transit telescope set on front flag and read both verniers. Shift the circle and remeasure the same angle with telescope reversed. If the two angles thus measured differ more than 60″, repeat the operation.

4. Along a railroad the operation of measuring is to be conducted as follows: The front tapeman puts a 20-pound tension on the front end of the 300-foot tape with a spring balance. He makes a chalk mark on the rail, or places a tack or nail on a tie, stake or measuring board, under the 300-foot mark for full tape lengths, and under the fractional graduation at stations. The distance which he records is checked by the transitman, and at

least one other member of the party. The tack or nail is left, surrounded by conspicuous chalk marks, and the same process is continued.

5. The rails should be counted by two other members of the party, who also check the number of tape lengths at the first opportunity. Each station should be marked by a small headed tack or pricking needle through a piece of white paper or cloth, its number being chalked on the rail near where it falls. The distance between stations should be limited to the visibility of the flag poles. Rails or center of track must not be used as alignment sights.

6. Along highways or open country the tape should be kept level. On steep slopes a plumb bob must be used, either to bring the tape vertically over an established point or to establish a new one, as the case may be. Tape lengths are marked on the measuring board, tie, or stake with the pricking needle. Where slopes are so steep as to render the leveling of the 300-foot tape impracticable a shorter tape must be used.

7. The chief and two other members of the party must keep an independent count of tape lengths. The temperature of the tape must be taken every hour in the day. Stations should be made at even tape lengths whenever practicable.

8. Observations for azimuth must be made at close of each day's work when possible, and azimuth stations should be not more than 10 miles apart, except on long tangents.

9. An azimuth observation must consist of not less than three direct and three reverse measures on three parts of the circle between polaris and an azimuth mark, to be made at any hour, but preferably near elongation, and the place, date, time, and watch error should be recorded.

10. The watch should be compared with standard time often enough to determine its error within ten seconds.

11. Where the line traversed is very crooked the instrument should be fitted for observation of solar azimuths, and these should be made at least twice in each day, weather permitting, in addition to polaris observations.

12. The record must contain a description of the starting point of the line and the beginning and ending of each day's work; also location of each railroad station, milepost, and switch passed, and wagon road, stream, land or county line crossed, and connection with corners of the public-land surveys.

13. Two permanent marks, either the copper bolts or the standard bronze tablets of the survey, should be placed not less than 500 feet apart at the beginning and end of each line, also at prominent junction points from which other primary control s may be started. A complete description and detailed sketch of these should be entered in the notebook.

14. Permanent marks of some kind should be left at such points passed during cloudy or unfavorable weather as it may be necessary to return to for the observation of azimuths.

15. Observations for magnetic declination must be made at several points in the course of a season's work, especially at county seats.

16. A complete record must be kept by the transitman in book No. 9-905 and a separate record of tape lengths by the front tapeman.

17. The transit notes should be entered and worked up in the following manner:

STATION.	POINTINGS: BACK AND TRANSITED.		Mean pointing.	Deflection angle.	Comp. azimuth.	Remarks.
	Vernier A.	Vernier B.				
	° ′ ″	° ′ ″	° ′ ″	° ′ ″		
392..............	65 48 00	245 48 00	65 48 00	0 46 00	....	11 a. m. 72°.
	65 02 00	245 02 00	65 02 00	....		
100 rails..........	....	....	65 02 00	0 46 00	....	76 road crossing.
2,975 feet........	64 16 00	244 16 00	64 16 00			
				0 46 00		
393..............	64 16 00	244 16 00	64 16 00	4 41 30	....	12 m. 73°.
	68 57 30	248 57 30	68 57 30	....		
39 rails	....	....	68 57 30	4 41 30	....	On road crossing.
1,197 feet........	73 39 00	253 39 00	73 39 00			
				4 41 30		

SPIRIT LEVELING.

1. A sufficient amount of accurate spirit leveling will be done to insure the placing of at least two permanent bench marks in each township or equivalent area surveyed, except in forest-clad and mountain areas and in the region east of the ninety-fifth meridian, where at least one shall be established; and these shall be established, whenever practicable, near the township corners of the public-land surveys. In addition to these, other bench marks should be located in prominent places, where they may be of service in the prosecution of future public or private surveys.

2. For each general locality of field work some centrally situated place will be chosen in which an elevation above sea level can be determined with approximate accuracy from railroad or other surveys. In this place are to be established two central datum bench marks, preferably tablets cemented in some solid masonry structure, to which will be referred all other bench marks in its neighborhood.

3. Permanent bench marks established in the course of the subsequent work should be so located that, like the central datum benches, they will not be liable to injury or disturbance, yet should be so prominently situated that they will be easy to find. They should consist of bronze or aluminum tablets, fastened with Portland cement into solid rock or masonry structures, as the foundations of buildings or bridge piers; or of the standard bronze-capped iron posts, which should be so set in the ground as to project about 1 foot. The intersection of the cross lines is the bench mark.

4. Primary level lines will be run with one or two rodmen and one levelman, and when necessary, a bubble tender. Wherever practicable such lines should be run in circuits which will check back upon themselves or other lines. Where long, unchecked lines are run, two rodmen must be employed and a double-rodded line be run (see page 67, paragraph 32).

5. Single-rodded lines.—Levelman and rodman must keep separate notes and compute differences of elevation immediately. As levelman and rodman pass, the former must read the rod him-

self, record and compare readings, then compute the elevation or H. I., and after computations are made compare results with the rodman. No comparisons may be made until the record is complete. If the results differ, each must read the rod before comparing anything but results.

6. Work on primary lines must not be carried on during high winds or when the air is "boiling" badly. During very hot weather an effort should be made to get to work early and to remain out late, rather than to work during midday.

7. Fore and back sights should be of equal length, and no sight over 300 feet should be taken except under unavoidable circumstances, as in crossing rivers at fords or ferries. In such cases extraordinary precautions must be taken, as repeated readings at changed positions of rod and level, etc.

8. If it is impracticable to take equal fore and back sights, as soon as the obstacle is passed take enough unequal sights to make each set balance. In this case extra care must be taken to insure correct adjustment of the level.

9. Distances along a railroad can be obtained by counting rails, and pacing when rails of different length from the ordinary 30-foot rail are encountered. At other times stadia or pacing may be used according to the quality of the work. The distances in miles of both fore and back sights must be recorded in both notebooks in the proper columns. The pace of the average man is about 2,000 to the mile—thus, if each time the right or left foot strikes the ground is counted, it will correspond to 0.001 of a mile.

10. The tripod clamping screw must be loosened when the instrument is set, and tightened only after the legs are firmly placed. Always level the instrument exactly before setting the target. After setting it and before giving the signal "all right" examine the level bubble. If found to be away from center, correct and reset target.

11. The level must be adjusted daily, or oftener if necessary. The adjustment of the line of collimation and of the level tube is especially important.

12. Provide rodmen with conical steel pegs, 6 to 12 inches long, with round heads, to be used as turning points. Never take turning points on rails or ties. Always drive the pegs firmly into the ground, and never pin between ties when stable soil or ballast is near, avoiding danger of disturbance from passing trains.

13. When the rod is lengthened beyond 6.5 feet, both the rodman and the levelman must examine the setting of the target as well as the reading of the rod vernier. When the rod is closed see that the rod vernier indicates 6.5 feet, not depending upon the abutting end to bring it back to place. Keep the lower end of the rod and the top of the turning point free from mud and dirt.

14. Plumbing levels must always be used and kept in adjustment, and long extensions of the rod avoided.

15. In long, unchecked, single-rodded lines make two target settings on each turning point, by first signaling "up" or "down" to setting, which is recorded by the rodman, then unclamping and signaling in the opposite direction to a setting. If the two differ more than 0.002 of a foot additional readings must be made. The rodman should record all readings, using in his computations only the first of the pair adopted, and the levelman the last.

16. The limit of error in feet should not exceed $0.05\sqrt{\text{distance in miles}}$.

17. When errors are discovered as the work progresses they must be reported at once to the topographer in charge.

18. When errors occur they are usually traceable to mistakes of a foot or a tenth of a foot in reading rods. Particular care should therefore be taken in getting these readings correctly.

19. Permanent bench marks along a railroad or highway should, when practicable, be placed outside the right of way. Bench marks on culverts, bridges, etc., are specially liable to removal during changes of the roadbed.

20. Endeavor to so locate permanent bench marks that the observed elevation shall be within one-tenth foot of the marked elevation. The figures of elevation must be stamped well into the metal cap, before the word "feet," and to the nearest foot only;

also the name or initial letter of the central datum point after the word " datum."

21. Place permanent bench marks near all important lakes and reservoirs.

22. Leave temporary bench marks at frequent intervals, marked so that they can be easily identified. They may be chiseled on a solid rock, or a nail may be driven in a knuckle cut on the root of a tree, or any other place where the mark will not be disturbed may be selected. One such bench mark should be left for every mile run, preferably near road corners, in order to give sufficient points to which to tie other spirit levels. Make notes opposite all elevations at crossings of roads, railroads, summits, streams, bridges, and in front of railway stations and public buildings, and all such other facts as may aid the topographer in his work. Mark in large figures in a conspicuous place the elevation to the nearest foot.

23. Stakes are forbidden for temporary bench marks except in country without suitable natural features. They should then be buried and a marker of bowlders or an earthen mound be left near them.

24. Contour crossings corresponding to the interval used should be marked on the ground in such a manner as to be readily recognized by the topographer or traverseman who follows. Preferably the same side of the road should be used for these markings, especially in desert country.

25. Use the regular Survey level books, No. 9-903; keep full descriptive notes on title page of every book, giving names, dates, etc. Each man should be responsible for his own notebook, and under no circumstances should erasures be made, a single pencil line being drawn through erroneous records.

26. Keep each set of notes separately and independently as taken, paying no attention whatever to other notes except to compare results. If on comparison errors are discovered, correct them only by new observations or computations. All notes must be recorded directly in a notebook; separate pieces of paper for figuring or temporary records, must not under any circumstances be used.

27. Levelmen must number their notebooks for each field season consecutively, whether working in one or more localities.

28. Level and rod books must be balanced daily for distances and rod readings. At the bottom of each page and at the end of a day's work, the levelman and rodman must add up the column of foresight and backsight rod readings and apply the differences between the same, with the proper sign, to the original elevation from which the day's work commenced, thus checking the result obtained by the separate additions and subtractions. The check must under no circumstances be omitted, all the figuring to appear on the right-hand page of the book. Side sights, determining elevations, should be put in column marked "Sta."

29. In the description of a bench mark, first give its general location, referred to some points on the line within a few miles, such as post offices, villages, depots, mileposts, schoolhouses, churches, fords, ferries, bridges, ranch and farm houses with names, such distances to be given in miles and tenths; then its relative position to nearby objects, such as roads, streams, houses, fences, mileposts, gates, etc., these distances to be noted in feet. Finally, with reference to the bench mark: If other than an iron post, tablet, or plug, state fully the size of the nail or spike and whether in side, root, or bottom of tree, giving diameter of tree in inches. If other objects, as telegraph poles, are used, describe fully. When stone bowlders are used describe the mark fully, whether chisel or paint. A plan should be made of permanent bench marks in both level and bench-mark description books.

30. Full descriptions of all permanent bench marks and of all secondary bench marks or elevations which may be useful for topographic work, with such sketches as may be needed, should be copied in ink in the bench-mark book No. 9-916 at the close of each day's work. In no case must the copying be allowed to get more than one week behind the field work. If permanent bench marks are not established when the line is first run, spaces should be reserved for descriptions to be added later, thus keeping descriptions in the order in which the bench marks

occur. Give at frequent intervals a brief description of the line, and when circuits are closed give errors and length of circuits by page references to connecting points. Make a plan of all lines or circuits, using one page near the back of the bench-mark book for each atlas sheet or group of circuits. On the plan indicate the names of a sufficient number of places to readily identify the line. If there are public-land surveys, show the position of the line in the township. Alongside of each line give reference to page in bench-mark book where line is recorded. Make descriptions and notes in the following general form, mileage in third column to be continuous for each circuit.

Date: August 14-18, 1901. Line from Clayton, N. Y., along public road via Orleans and Theresa to Redwood, N. Y.

LEVELMAN'S		Miles from—	Marked—	Elevation.	Adjusted elevation.	Description.
Book.	Page.					
3	2	Clayton. 0	279 Cape Vincent.	278.762	278.762	Clayton, Catholic church SW. corner of; on water table bronze tablet, marked "279, Cape Vincent, 1900." (See p. 3, this book.)
3	4	3	261	261	....	Clayton, 3 miles east of; at four corners, center of roads (line continued east).
3	7	5.7	254	253.806	....	Orleans, corner of Mead and Main streets; NW. angle of large rock, 5 feet from fence chiseled square.
3	11	7.9	241	241.372	....	Orleans, 1.8 miles east of; at NE. angle of road to right, large oak tree, nail in root of.
3	14	12.6	266 Cape Vincent.	265.873	....	Theresa, high school, front face of; on water table, aluminum tablet marked "266, Cape Vincent, 1900."
				265.631	....	Old elevation of same B. M. (See page 6 this book.) Closure error, 0.242.

31. The following are samples of descriptions where public land lines or corners are the most important features:

T. 141 N., R. 64 W.: Northern Pacific Railroad, crossing of east-west line between sections 22 and 24, top of rail.

T. 143 N., R. 65 W., S. 11, NW. corner of; highest point of rock at section corner.

T. 90 N., R. 3 W., S. 28, ¼ corner, east side of; SE. corner schoolhouse yard, iron post marked "1090."

32. *Double-rodded lines.*—In running unchecked or single primary lines with two rodmen, they should hold on turning points 10 to 20 feet apart, but each at equal distances for fore and back sights; otherwise the above instructions are to be followed, with the following modifications:

33. The instrument must be shaded at all times by a bubble tender.

34. The back-sight points must not be moved until the levelman has set targets on the new foresights, so that there shall be in the ground at all times two turning points the elevations of which are known.

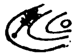
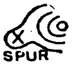
35. Bench marks left at termination of work at night, or for rain or other cause, should be turning points in the continuous line. They should consist of large wooden pegs driven below the surface of the ground, with a copper nail firmly imbedded in the top. One of these pegs is to be used as the final turning point for each rodman. They are to be covered with dirt or otherwise hidden, their location being marked by sketches in notebooks showing relation to railroad ties, telegraph poles, etc.

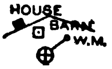
SECONDARY TRAVERSE.

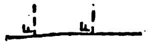
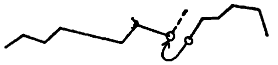
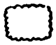
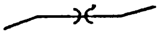
1. Traversing consists of much more than the getting of direction and distance, though these are the absolutely essential features. Next in importance is the drawing of long direction lines for intersection on houses, stream crossings, wood outlines, etc.

2. Traversemen must keep on hand traverse record books 9–896, and on long sights will make a sketch of the road traversed and record the distance to houses, stream crossings and wood outlines; also show how houses are placed in regard to the road or line of sight, and as nearly as possible, the angle made by woods and streams with the road traversed, in order that when they make a station these data can be properly transferred to the traverse sheet. This transfer should be made station by station and not left until night or a rainy day.

3. After the traverse is completed as far as the immediate road is concerned, the traverseman should then concern himself with get-

ting locations of prominent objects between roads, as these will aid in adjusting and sketching. Sights should be taken to prominent hilltops, corners of woods, prominent trees, etc., and appropriate symbols should be attached when intersected; thus ⊙ for hilltops, for fir trees, for deciduous trees, for stumps, for hilltops with flags. If trees are intersected which are not on hilltops, they should be noted thus:  showing approximately their relation to the top. If a spur and not the main top is located, represent it thus: 

All schoolhouses and churches should be accurately located and represented thus: for schools, for churches. Town, county, and other political or public-land lines, should be shown where they cross roads, or are otherwise accessible. All small ponds near roads should be traversed to and surveyed, if necessary, on foot. Generally barns or sheds grouped about a dwelling house should not be indicated on the traverse sheet, although as an aid to sketching it is often desirable to note locations of large barns and windmills thus: 

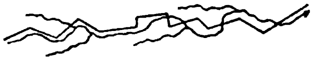
On roads where there are few houses, barns should be noted with symbol: □ Fence lines thus:  Do not try to make traverses close if they do not properly do so, but show them unconnected, thus:  Show wood lines and areas by crinkled line, thus:  On roads, or lines of traverse where there is little detail, summits may be shown thus: 

4. Where traverse is run over roads which have been recently leveled, note elevations marked on fences, at summits, bridges, corners, etc., and record same on traverse sheet.

5. Do not have unconnected circuit junctions occur in towns or villages.

6. Houses when separated by spaces larger than the houses themselves should be shown on the maps as detached, even though the full number of houses can not be indicated.

7. Streams should be sketched in near the roads as accurately as he skill and experience of the traverseman will permit. Especially

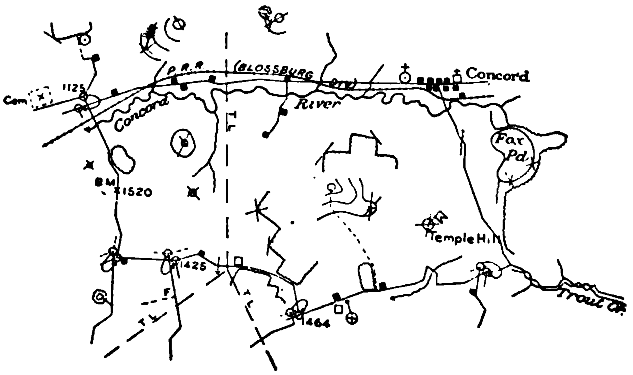
should streams crossing and recrossing roads traversed in ravines or gullies be sketched, and junctions shown with side streams Thus: 

8. All of the traverse sheet, except that in use, should be kept covered in brown paper, and on the under side of the sight alidade should be pasted a thin piece of cloth or paper. The name of the quadrangle being mapped, and the traverseman's name and address, as well as that of the party chief, should in the beginning be plainly written on the corner of the traverse sheet.

9. Names of villages, streams, hills, etc, should be obtained in the field as far as possible — especial care being taken to get correct spelling — and be plainly written on the traverse.

10. The true measure of a traverseman's ability is the fidelity and correctness with which he shows to scale all the foregoing facts, so that the topographer who follows can go ahead with his sketching without the necessity of correcting location of houses, woods, streams, hilltops, etc., or of retraversing faulty work.

EXAMPLE OF TRAVERSE.



TOPOGRAPHIC FIELD WORK.

1. At least two primary triangulation points or two primary control lines should be platted on each atlas sheet previous to commencing field work.

2. All existing map material should be diligently sought for; such of this as may be of value, as public-land plats, railroad,

may be sharp contrasts between its color and that of the inked lines.

3. The sheets must be inked clearly and carefully, with uniformity throughout, and in such manner as to adapt them for one-third reduction to publication scale. Only such ink should be used as will photograph readily. (See paragraph 11, above.) Culture should be inked first, and standard conventional signs used.

4. Where it is evident that boundaries follow streams or roads, the former may be omitted when copy would be disguised. When detail would be obliterated by large roman letters the shading should be omitted, leaving the letters in outline.

5. Every fifth contour must be accented, except where the contour interval is 25 feet, in which case every fourth one is accented. Contours are accented by drawing them slightly heavier, not broken or dotted. In close contouring accentuation may be made by increasing depth of color of ink. On steep and uniform slopes intermediate contours—those between the accented ones—should be omitted, except when needed to show detail.

6. In drawing streams, care should be taken that the lines shall not become faint and uncertain near the sources of the streams, and the placing of drainage in every little gully simply to indicate that it may be a water course should be avoided. Use the symbol dash and three dots for intermittent streams.

7. In lettering, names parallel to the east or west sides of the sheet should read from the south side. Names of railroads, streams, etc., should always be on the upper side—that is, so that when the map is held in the ordinary position the letters shall not appear upside down. Names should be placed horizontally across the middle of such areas as townships, land grants and reservations; but in case of narrow north-south strips they should be placed vertically. Names of minor importance and figures of elevation should be placed close to the object, on the right and horizontally. The letters, figures and cross pertaining to a bench mark should be arranged with the letters above and to the left of the cross, and the figures below and to the right.

8. The standard conventions should be used as far as practicable. When unusual symbols are used they should be fully explained by a legend on the margin of the sheet.

9. Timber and land classification outlines should not appear on the original drawing, but should be submitted on a separate tracing.

10. The original drawing of a topographic sheet shall be verified by some competent person in addition to the topographer who compiles it, by comparison with field sheets, and such "proofreading" shall be recorded on the appropriate form (Record of Proofreading) and be signed before it receives the approval of the chief of the topographic section for editing.

11. The standard scales for the published topographic sheets shall be multiples of 1:1,000,000, as 1:250,000, 1:125,000 and 1:62,500, for small-scale maps; and for more detailed economic maps, multiples of 1,000 feet to 1 inch, as 12,000, 1:24,000, 1:36,000 and 1:48,000. The contour interval may be 200 feet, 100 feet, 50 feet, 25 feet, 20 feet or 10 feet for the first group, and 5 feet, 10 feet, 20 feet, 25 feet or 50 feet for the second, according to the nature of the topography and the requirements of each case.

MAGNETIC DECLINATION.

1. Diagrams showing magnetic declination to the nearest quarter degree will be placed on all topographic sheets.

2. The magnetic declination will be determined graphically in the field for each quadrangle surveyed by measuring the angle between the true north and the magnetic north, as indicated by needle, using for this purpose the special sight compass. This should be done at all primary triangulation stations and at such other points as may be necessary in order to secure at least one declination in each quarter of the quadrangle.

3. The method of procedure will be as follows:

(a) Orient the plane table by placing the edge of the sight compass on the line connecting the triangulation point from which the magnetic declination is to be made and some well-located point on the plane-table sheet, using sight compass as an alidade.

(b) Obtain magnetic north by sight compass, and, using same edge of compass by which orientation was obtained, draw line through point occupied and extend it so as to intersect the nearest north-south projection line.

(c) From a point on the projection line 10 inches north of this point of intersection measure the distance on a true east-west line to the magnetic north line.

(d) With this distance enter the table given below of natural tangents and take out the corresponding angle to the nearest quarter degree, checking the angle with a protractor.

Natural Tangents for a Radius of 10 Inches, 0° to 24°.

Angle.	Natural tangents.	Angle.	Natural tangents.	Angle.	Natural tangents.	Angle.	Natural tangents.
Degrees.	Inches.	Degrees.	Inches.	Degrees.	Inches.	Degrees.	Inches.
0	0.00	6	1.05	12	2.13	18	3.25
¼	.04	6¼	1.10	12¼	2.17	18¼	3.30
½	.09	6½	1.14	12½	2.22	18½	3.35
¾	.13	6¾	1.18	12¾	2.26	18¾	3.40
1	.18	7	1.23	13	2.31	19	3.44
1¼	.22	7¼	1.27	13¼	2.36	19¼	3.49
1½	.26	7½	1.32	13½	2.40	19½	3.54
1¾	.31	7¾	1.36	13¾	2.45	19¾	3.59
2	.35	8	1.40	14	2.49	20	3.64
2¼	.39	8¼	1.45	14¼	2.54	20¼	3.69
2½	.44	8½	1.50	14½	2.59	20½	3.74
2¾	.48	8¾	1.54	14¾	2.63	20¾	3.79
3	.52	9	1.58	15	2.68	21	3.84
3¼	.57	9¼	1.63	15¼	2.73	21¼	3.89
3½	.61	9½	1.67	15½	2.77	21½	3.94
3¾	.66	9¾	1.72	15¾	2.82	21¾	3.99
4	.70	10	1.76	16	2.87	22	4.04
4¼	.74	10¼	1.81	16¼	2.92	22¼	4.09
4½	.79	10½	1.85	16½	2.96	22½	4.14
4¾	.83	10¾	1.90	16¾	3.01	22¾	4.19
5	.88	11	1.94	17	3.06	23	4.24
5¼	.92	11¼	1.99	17¼	3.10	23¼	4.30
5½	.96	11½	2.04	17½	3.15	23½	4.35
5¾	1.01	11¾	2.08	17¾	3.20	23¾	4.40
....	....	....	....	....	....	24	4.45

4. The resulting mean from all determinations within a quadrangle will be selected for the diagram, and below the diagram will be placed the words, "Approximate mean declination, 190–."

5. Report each month, under the head of "Remarks," on the monthly report of topographic party, the declination determined, indicating positions of same in the diagram "Area controlled."

MONTHLY REPORTS OF FIELD PARTIES.

1. Promptly at the close of every month each party chief will mail a report to his immediate chief on the proper form.

2. For the report of topographic field work, form 9-908 is to be used. A separate sheet must be used for each quadrangle, in order that section chiefs may be able to keep a distinct account of each quadrangle, and thus estimate its quality and cost. For example, in making up reports of field work on three quadrangles in one month, the party chief should apportion the amount of work and the cost among the three report sheets as nearly as practicable, because he is better able to make such a division than are the section chiefs. The total of the three should be accurate, though the details of each may necessarily be approximate.

3. In making up the diagrams on the back of the report sheet, the endeavor should be, where several kinds of work are in progress in one party, to use a separate diagram for each kind. Thus, one diagram should show the area controlled by traverse, distinguishing between kinds of traverse; another, the area leveled, and a third, the area sketched. Frequently it will be impossible so to distinguish the varieties of work.

4. Party chiefs making out reports for primary triangulation or traverse should use the form 9-920, provided for this purpose, and should fill in the various details noted thereon, so far as circumstances will permit. If the work was done during the month on areas in different localities, a separate report should be submitted for each area.

EDITING TOPOGRAPHIC MAPS.

1. When a topographic sheet is submitted for publication, the chief of the topographic section, or his representative, shall transmit it, accompanied with two photographs or photo-lithographs on scale of publication, to the Director, for forwarding to the editor of topographic maps.

2. The editor of topographic maps will supply for each sheet a jacket, noting thereon the date of transmittal. He will edit

the map and consult with the chief of the topographic section or his representative regarding any changes.

3. When the editor of topographic maps is satisfied that the map is complete and in proper form, he shall indorse the jacket, "approved for engraving," with the date.

4. After correcting combined proof, the editor of topographic maps will submit to the chief of the topographic section, or whoever represents him, the manuscript of all corrections and proofs relating thereto in their jacket, including two extra sets of combined proof, and it shall be the duty of the chief of the topographic section to cause this proof to be read by a competent assistant. One extra proof may be retained in his file set.

The chief of the topographic section will return the manuscript and all proofs to the editor of topographic maps, who will consolidate all corrections on the engraver's proof, and, when all questions relating to the proofs have been settled and all corrections made on plates and stones, will approve the sheet for printing.

6. Except the original transmission of the sheet (par. 1) maps going from the chiefs of topographic sections to the editor of topographic maps, and vice versa, may be sent directly.

7. In transmitting manuscript maps and proofs from one division to another, the officer in charge will indorse upon the jacket the date of transmittal and the purpose for which the map was referred. In those cases in which the material is sent through the chief clerk, in order that the transmittal may be made a matter of record in the central office, a letter of transmittal, to be ultimately placed on file, is also necessary.

NOTE.—*When the survey has been made and mapped in accordance with these instructions, the first proof impression of a sheet is sent to the State Engineer of New York at Albany for examination and for any changes or corrections which he may suggest. Such suggestions are then examined and considered at Washington and agreement regarding them is reached before final publication, after which the sheets are for sale to the public by the Director of the United States Geological Survey, at Washington, D. C., at the nominal price of five cents for each separate sheet, or two cents for each sheet when ordered in lots of 100 or more copies.*

Index of Streams and Gauging Stations, 1903.

No. on Map.	Page.	Stream.	Gauging Station.	County.
6	190	Allegheny River	Redhouse, N. Y.	Cattaraugus.
59	151	Byram River, East branch	Round Hill, Conn	Fairfield.
63	147	Byram River, Middle branch.	Near Glenville, Conn	Fairfield.
60	148	Byram River, West branch	Schilts Mill, Conn	Fairfield.
58	146	Byram River	Pemberwick, Conn	Fairfield.
12	......	Beaver River	Beaver, N. Y	Herkimer.
43	19	Beaver River	Tisse's Bridge, near Croghan, N. Y.	Lewis.
7	......	Black River	Felts Mills, N. Y	Jefferson.
14	186	Cayuta Creek	Waverly, N. Y	Tioga.
16	183	Chemung River	Chemung, N. Y	Chemung.
41	29	Chittenango Creek	Chittenango, N. Y	Madison.
32	134	Catskill Creek	South Cairo, N. Y	Greene.
9	169	Chenango River	Binghamton, N. Y	Broome.
55	163	Delaware River, W. branch,	Hancock, N. Y	Delaware.
54	165	Delaware River, E. branch	Hancock, N. Y	Delaware.
17	77	East Canada Creek	Dolgeville, N. Y	Herkimer.
33	127	Esopus Creek	Kingston, N. Y	Ulster.
48	132	Esopus Creek	Olive Bridge, N. Y	Ulster.
45	112	Fishkill Creek	Glenham, N. Y	Dutchess.
24	......	Genesee River	Mt. Morris, N. Y	Livingston.
1	43	Genesee River	Rochester, N. Y	Monroe.
26	91	Graefenberg Creek	New Hartford, N. Y	Herkimer.
27	106	Hoosic River	Buskirk, N. Y	Rensselaer.
22	......	Hudson River	Fort Edward, N. Y	Saratoga.
29	104	Hudson River	Mechanicville, N. Y	Saratoga.
38	138	Housatonic River	Gaylordsville, Conn	Litchfield.
56	46	Honeoye Creek	East Rush, N. Y	Monroe.
20	108	Indian Lake	Indian Lake, N. Y	Hamilton.
39	98	Johnson Brook	Deerfield, N. Y	Oneida.
46	65	Lake Champlain	Fort Montgomery, Rouse's Point, N. Y	Clinton.
28	......	Mohawk River	Dunsbach Ferry, N. Y	Saratoga.
18	......	Mohawk River	Little Falls, N. Y	Herkimer.
15	99	Mohawk River	Utica, N. Y	Oneida.
44	24	Moose River	Moose River, N. Y	Lewis.
61	152	Mianus River	Near Stamford, Conn	Fairfield.
62	155	Mianus River	Bedford, N. Y	Westchester.
49	160	Neversink River	Port Jervis and Goddefroy, N. Y	Orange.
13	101	Oriskany Creek	Wood Road, Oriskany, N. Y	Oneida.
2	41	Oswego River	Battle Island	Oswego.
52	36	Oneida River	Euclid, N. Y	Oswego.
51	54	Oak Orchard Creek	Near Medina, N. Y	Orleans.
5	62	Oswegatchie River	Ogdensburg, N. Y	St. Lawrence.

No. on Map.	Page.	Stream.	Gauging Station.	County.
19	63	Raquette River	Massena Springs, N. Y	St. Lawrence.
34	......	Rondout Creek	Honk Falls, N. Y	Ulster.
35	122	Rondout Creek	Rosendale, N. Y	Ulster.
31	94	Reel's Creek	Deerfield, N. Y	Oneida.
57	156	Ramapo River	Near Suffern, N. Y	Rockland.
40	71	Saranac River	Near Saranac Lake, N. Y	Franklin.
42	70	Saranac River	Plattsburg, N. Y	Clinton.
10	168-179	Susquehanna River	Binghamton, N. Y	Broome.
8	26	Salmon River	Pulaski, N. Y	Oswego.
23	74	Schoharie Creek	Mill Point, N. Y	Montgomery.
53	75	Schoharie Creek	Prattsville, N. Y	Greene.
25	......	Schoharie Creek	Schoharie Falls, N. Y	Montgomery.
47	87	Starch Factory Creek	New Hartford, N. Y	Herkimer.
3	39	Seneca River	Baldwinsville, N. Y	Onondaga.
4	33	Skaneateles Outlet	Willow Glen, N. Y	Onondaga.
21	......	Schroon River	Warrensburg, N. Y	Warren.
50	92	Sylvan Glen Creek	New Hartford, N. Y	Oneida.
37	142	Ten Mile River	Dover Plains, N. Y	Dutchess.
36	118	Wallkill River	New Paltz, N. Y	Ulster.
11	81	West Canada Creek	Twin Rock Bridge, N. Y	Oneida.
30	116	Wappinger Creek	Wappinger Falls, N. Y	Dutchess.

Index of Hydrographs Accompanying Report on New York Stream Gaugings, 1903.

Stream.	Station.	Years.	Facing page.
Catskill Creek	South Cairo	'03	188
Chenango River	Binghamton	'03	182
Chittenango Creek	Chittenango	'01, '02, '03	82
Esopus Creek	Kingston	'03	132
Fishkill Creek	Glenham	'03	116
Housatonic River	Gaylordsville	'00, '01, '02, '03	142
Hudson River	Mechanicville	'98, '99, '00, '01, '02, '03	104
Oswego River	Battle Island, near Minetto	'00, '01, '02, '03	42
Rondout Creek	Rosendale	'03	126
Seneca River	Baldwinsville	'99, '02, '03	40
Susquehanna River	Binghamton		182
Ten Mile River	Dover Plains	'03	146
Wallkill River	New Paltz	'03	122

Index of Illustrations Accompanying Report on New York State Stream Gaugings, 1903.

Stream.	Subject.	Facing page.
Au Sable River	Au Sable Chasm	66
Au Sable River	At head of Au Sable Chasm	70
Current Meter		14
Eighteen Mile Creek	Dam at Newfane	110
East Canada Creek	Beardslee Falls and Power-house	138
East Oronoc Creek	Islip, L. I	139
Gauging Stations map	Areas	323
Genesee River	Gauging Station at Jones Bridge	44
Genesee River	Dam at Mt. Morris	46
Mianus River	Gauging Station at Sedgwicks	154
Mohawk River	Cohoes Falls, Cohoes	100
Mohawk River	State Dam at Little Falls	98
Moose River	Timber Dam. McKeever	24
Oneida River	Oak Orchard Dam	86
Oneida River	Schroeppel's Bridge	88
Oswego River	Cable Station above Minetto	42
Oswego River	High Dam	42
Ramapo River	Gauging Station near Suffern	158
Reel's Creek	Weir near Utica	96
Salmon River	Salmon River Falls, Oswego County	26
Saranac River	Dam No. 10, Cadyville	72
Saranac River	High Falls, Double Cascade	74
Saranac River	State Dam and Lock	72
Starch Factory Creek	Gauging Weir	90
Tonawanda Creek	Indian Falls, Genesee County	56
West Canada Creek	Trenton Falls Dam	82

INDEX TO SUPPLEMENT

TO THE

ANNUAL REPORT OF THE STATE ENGINEER AND SURVEYOR OF NEW YORK, 1903.

PAGE.

Allegany River:
  At Redhouse, Cattaraugus county 190
    Discharge 191
    Gauge readings 191

Allegany River:
  Drainage tributary to:
    Allegany River, Redhouse 190
    Chautauqua Lake, Chautauqua 191

Ausable River, views of, facing 66–70

Beaver Brook:
  Near Diamond Hill, Herkimer county 78
    Measurements 79

Beaver River:
  At Tisse's Bridge, Lewis county 19
    Discharge 20

Byram River:
  Drainage area 147
  Gauging stations 149
  At Pemberwick, N. Y.:
    Discharge 150
  East Branch, Greenwich, Conn.:
    Discharge 151
  Middle Branch, Glenville, N. Y.:
    Discharge 150
  Middle Branch, Riverville, Conn.:
    Discharge 151
  West Branch, Port Chester, N. Y.:
    Discharge 149

Catskill Creek:
  At South Cairo, Greene county 134
    Discharge 135
    Hydrograph 138

	PAGE.
Cayuta Creek:	
At Waverly, Tioga county	186
Drainage areas	187
Elevations	187
Champlain Lake outlet:	
Drainage tributary to:	
Richelieu River, Fort Montgomery	65
Saranac River, Saranac Lake	71
Richelieu River	65
Discharge	69
Elevations	68
Chautauqua Lake:	
Chautauqua county	191
Discharge	192
Chemung River:	
At Chemung, Chemung county	183
Discharge	185
Drainage areas	185
Gauge readings	185
Chenango River:	
At Binghamton, Broome county	169
Discharge	171
Gaugings, miscellaneous	173
Hydrograph	182
Chenango River:	
At South Oxford, N. Y.:	
Gauge readings	176
Chittenango Creek:	
At Chittenango, Madison county	29
Discharge	30
Hydrographs, 1901, 1902, 1903	32
Co-operative Survey of State:	
Appropriation for	193
Instruction for	301
Maps, land classification	204
Two mile series	206
Meridian Marks:	
Cattaraugus county	220
Chautauqua county	220
Wyoming county	220
Office work	204
Precise Leveling:	
Albany county	231, 234
Allegany county	234, 243
Broome county	234, 239
Cattaraugus county	234, 245
Chautauqua county	246
Chemung county	234, 243

Co-operative Survey of State—(Continued): PAGE.
  Precise Leveling—(Continued):
    Chenango county 240
    Delaware county 239, 240
    Erie county 246
    Franklin county 229
    Jefferson county 232
    Lewis county 232
    Livingston county 243
    Madison county 240
    Monroe county 243
    Oneida county 232, 240
    Orange county 239
    Otsego county 234, 240
    Saratoga county 231
    Schenectady county 234
    Schoharie county 234
    Steuben county 234, 243
    Sullivan county 239
    Tioga county 234
    Ulster county 239
    Warren county 231
  Primary Leveling:
    Albany county 264
    Allegany county 294
    Broome county 276
    Cattaraugus county 294, 295
    Cayuga county 281, 284
    Chautauqua county 294
    Chemung county 281, 284, 289
    Chenango county 276
    Columbia county 264
    Cortland county 276
    Delaware county 264, 270
    Dutchess county 264
    Erie county 299
    Essex county 249, 251, 257
    Franklin county 249, 251
    Fulton county 251, 257, 260, 232
    Genesee county 291, 298, 299
    Greene county 264
    Hamilton county 249, 251, 257, 260, 263
    Herkimer county 251, 260
    Jefferson county 271, 273
    Lewis county 251, 273
    Livingston county 291
    Madison county 276
    Monroe county 284, 291, 298
    Montgomery county 251, 257, 260
    Nassau county 247

- Co-operative Survey of State—(Continued): PAGE.
  - Primary Leveling—(Continued):
    - Niagara county 299
    - Oneida county 251, 273
    - Onondaga county 276, 281, 284
    - Ontario county 284, 289, 291
    - Orange county 264
    - Orleans county 299
    - Oswego county 273, 284
    - Otsego county 263, 270
    - Queens county 247
    - Saratoga county 262, 264
    - Schenectady county 264
    - Schoharie county 264, 270
    - Schuyler county 284, 289
    - Seneca county 284
    - Steuben county 284, 289, 291
    - St. Lawrence county 251, 271
    - Suffolk county 247
    - Tioga county 281
    - Tompkins county 281, 284
    - Ulster county 264, 270
    - Warren county 251, 257, 262
    - Washington county 264
    - Wayne county 284
    - Wyoming county 291
    - Yates county 284, 289
  - Primary traverse 221
  - Progress map 198
  - Published sheets 205
    - Results, résumé of 195
  - Spirit leveling 204, 223
  - Summary, field work 202
  - Triangulation, stations:
    - Allegany county 207
    - Cattaraugus county 207
    - Jefferson county 214
    - Lewis county 215
    - Livingston county 217
    - Wyoming county 218
- Delaware River:
  - Drainage tributary to:
    - East Branch, Hancock 165
    - West Branch, Hancock 163
    - Neversink River, Port Jervis 160
  - East Branch, at Hancock, Delaware county 165
    - Discharge 166
    - Gauge readings 167
  - West Branch, at Hancock, Delaware county 163
    - Discharge 164
    - Gauge readings 165

PAGE.

Eaton Brook:
  Madison county:
    Discharge 174

Eighteen Mile Creek, dam at Newfane, N. Y., view of, facing.... 110

Esopus Creek:
  At Kingston, Ulster county.............................. 127
    Discharge 128
    Hydrograph 132
  At Olive Bridge... 132
    Discharge 133
    Gauge reading 133

Fishkill Creek:
  At Glenham, Dutchess county............................. 112
    Discharge 113
    Hydrograph 116

Foundry Brook:
  Near Cold Spring, Putnam county......................... 110
    Discharge 111

Genesee River:
  At Jones Bridge, Livingston county...................... 44
    Discharge 45
    View of, facing..................................... 44
  At Mt. Morris Dam, views, facing........................ 46
  At Rochester, Monroe county............................. 43
    Discharge 44

Graeffenberg Creek:
  Near New Hartford, Herkimer county...................... 91
    Discharge 91
    Precipitation 92

Gauging Stations, map, facing............................. 322

Hemlock Lake:
  At Hemlock Lake, Livingston county...................... 48
    Discharge 53
    Diversion 52
    Elevation 51

Honeoye Creek:
  At East Rush, Monroe county............................. 46
    Drainage area....................................... 48

Hoosic River:
  At Buskirk, Rensselaer county........................... 106
    Discharge 107
    Drainage areas...................................... 107
    Gauge readings...................................... 108

Housatonic River:
  At Gaylordsville, Conn.................................. 138
    Discharge 139
    Hydrographs 142

Hudson River, Lower: PAGE.
  Drainage tributary to:
    Catskill Creek, South Cairo.......... 134
    Esopus Creek, Kingston.......... 127
    Esopus Creek, Olive Bridge.......... 132
    Fishkill Creek, Glenham.......... 112
    Foundry Brook, Cold Spring.......... 110
    Housatonic River, Gaylordsville.......... 138
    Rondout Creek, Rosendale.......... 122
    Ten Mile River, Dover Plains.......... 142
    Wallkill River, New Paltz.......... 118
    Wappinger Creek, Wappinger Falls.......... 116

Hudson River, Upper:
  Drainage tributary to:
    Hoosic River.......... 106
    Hudson River.......... 104
    Indian River.......... 108
    Miscellaneous discharge measurements.......... 109

Hudson River:
  At Mechanicville, Saratoga county.......... 104
    Discharge 104
    Hydrograph 104

Indian River:
  Indian Lake, dam, Hamilton county.......... 108
    Storage 109

Introduction 5

Irondequoit River:
  At Penfield, Monroe county.......... 60
    Discharge 61

Johnston Brook:
  At Deerfield, Oneida county.......... 94
    Discharge 98

Lake Champlain:
  Drainage tributary to:
    Richelieu River.......... 65
    Saranac River.......... 70

Lake Champlain outlet:
  Richelieu River.......... 65
    Drainage 68
    Elevation 69

Lake Ontario:
  Drainage tributary to:
    Beaver River, Tisse's Bridge, Lewis county.......... 19
    Chittenango Creek, Chittenango, Madison county.......... 29
  Genesee River:
    Jones Bridge, Livingston county.......... 44
    Rochester, Monroe county.......... 43
  Hemlock Lake, Hemlock Lake, Livingston county.......... 48
    Honeoye Creek, East Rush, Monroe county.......... 46

PAGE.

- Lake Ontario—(Continued):
    - Irondequoit River, Penfield, Monroe county 60
    - Moose River, Moose River, Lewis county 24
    - Oak Orchard Creek, Medina, Orleans county 54
    - Oneida River, Schroeppels Bridge, Onondaga county 36
    - Oswego River, Minetto, Oswego county 41
    - Salmon River, Pulaski, Oswego county 26
    - Seneca River, Baldwinsville, Onondaga county 39
    - Skaneateles Lake Outlet, Willow Glen, Onondaga county 33
- Long Island and Long Island Sound:
    - Drainage tributary to:
        - Byram River, East Branch, Greenwich, Conn 151
        - Byram River, Middle Branch, Glenville, N. Y 150
        - Byram River, Middle Branch, Riverville, Conn 151
        - Byram River, at Pemberwick 150
        - Byram River, West Branch, Port Chester, N. Y 149
        - East Oronoc Creek, Islip, Long Island, view, facing 139
        - Mianus River, Stamford, Conn, 152
- Madison Brook, Madison county:
    - Discharge 175
- Mianus River:
    - At Bedford, Westchester county:
        - Discharge 155
    - At Stamford, Conn 152
        - Discharge 154
    - At Sedgwicks, Conn., view, facing 154
- Mohawk River:
    - Drainage tributary to:
        - Beaver Brook, Herkimer county 78
        - Graeffenberg Creek, New Hartford, Herkimer county 91
        - Johnston Brook, Deerfield, Oneida county 94
        - Nine Mile Creek, South Trenton, Oneida county 100
        - Oriskany Creek, Oriskany, Oneida county 101
        - Reel's Creek, Deerfield, Oneida county 94
        - Schoharie Creek:
            - Mill Point, Montgomery county 74
            - Prattsville, Greene county 75
        - Spruce Creek, Dolgeville 77
        - Starch Factory Creek, New Hartford, Herkimer county 87
        - Sylvan Glen Creek, New Hartford, Herkimer county 92
        - West Branch Mohawk, West Branch, Oneida county 102
        - West Canada Creek, Twin Rock Bridge, Oneida county 81
    - At State Dam, Little Falls, N. Y., view, facing 98
    - At Utica, Oneida county:
        - Discharge 99
- Moose River:
    - At Moose River, Herkimer county 24
        - Discharge 25
        - Drainage areas 25
        - Gauge readings 25

Moose River—(Continued): PAGE.
- Timber Dam, McKeever, view, facing ... 24

Neversink River:
- At Port Jervis, Orange county ... 160
  - Discharge ... 161
  - Gauge reading ... 161

Nine Mile Creek:
- At South Trenton, Oneida county ... 100
  - Discharge ... 101

Oak Orchard Creek and Tonawanda feeder:
- Near Medina, Orleans county ... 54
  - Discharge ... 58
  - Gauge readings ... 59

Oneida River:
- At Schroeppel's Bridge, Onondaga county ... 36
  - Discharge ... 37
  - Views of, facing ... 36, 38

Oriskany Creek:
- At Oriskany, Oneida county ... 101
  - Discharge ... 102

Oswego River:
- At Battle Island, Oswego county:
  - Discharge ... 41
- Oak Orchard Dam, view of, facing ... 36

Oswegatchie River:
- Near Ogdensburg, St. Lawrence county ... 62
  - Discharge ... 63
  - Drainage areas ... 62
  - Gauge readings ... 63

Passaic River:
- Drainage tributary to:
  - Ramapo River, Suffern, N. Y. ... 156

Raquette River:
- At Massena Springs, St. Lawrence county ... 63
  - Discharge ... 63
  - Drainage areas ... 65

Ramapo River:
- Near Suffern, Rockland county ... 156
  - Discharge ... 157
  - Drainage ... 158
  - Gauge readings ... 158
  - View of, facing ... 158
- At Pompton, N. J.:
  - Discharge ... 159

Reels Creek:
- At Deerfield, Oneida county ... 94
  - Discharge ... 96
  - Precipitation ... 95

PAGE.

Richelieu River:
  Outlet Lake Champlain.................................... 65
    Discharge 69
    Elevation 68

Rondout Creek:
  At Rosendale, Ulster county.................................... 122
    Discharge 123
    Hydrograph 126

Saint Lawrence River:
  Drainage tributary to.................................... 61
    Oswegatchie River.................................... 62
    Racquette River.................................... 63

Salmon River:
  Above Pulaski, Oswego county.................................... 26
    Discharge 27

Saranac River:
  At Plattsburg, Clinton county.................................... 70
    Discharge 71
    Flow 70
  Near Saranac Lake, Franklin county.................................... 71
    Discharge 73
    Drainage areas.................................... 72

Saranac River views:
    Dam No. 10 72
  High Falls, N. Y.................................... 74
  State Dam, Saranac Lake, N. Y.................................... 72

Schoharie Creek:
  At Mill Point, Montgomery county.................................... 74
    Discharge 74
    Gauge readings 75
  At Prattsville, Greene county.................................... 75
    Discharge 76
    Gauge readings 76

Seneca River:
  At Baldwinsville, Onondaga county.................................... 39
    Discharge 40

Skaneateles Lake outlet.................................... 33
    Discharge 34

Spruce Creek:
  At Dolgeville, N. Y.................................... 77
    Discharge 78

Starch Factory Creek:
  Near New Hartford, Herkimer county.................................... 87
    Discharge 89
    Precipitation 90
    View of, facing.................................... 90

Streams and stations, index of.................................... 323

Moos
T
Never
A
Nine]
A
Oak O
N
Oneida
At
Oriska
At
Oswego
At
Oa
Oswega
Ne
Passaic
Dra
Raquett
At
Ramapo
Nea
At F
Reels Cr
At I

PAGE

Survey of State—See Co-operative Survey of State.

Susquehanna River:
  Drainage tributary to:
    Cayuta Creek, Waverly 186
    Chemung River, Chemung 183
    Chenango River, Binghamton 168
    Chenango River, Miscellaneous gaugings 172
    Susquehanna River, Binghamton 179

Susquehanna River:
  At Binghamton, Broome county 167, 179
    Discharge 168, 179
    Drainage area 169
    Floods 182
    Hydrograph 182

Sylvan Glen Creek:
  Near New Hartford, Herkimer county 92
    Discharge 93

Ten Mile River:
  Below Dover Plains, Dutchess county 142
    Discharge 143
    Hydrograph 146

Tioughnioga River:
  At Chenango Forks:
    Gauge readings 177

Tonawanda Creek:
  Indian Falls, Genesee county, view of, facing 56

Wallkill River:
  At New Paltz, Ulster county 118
    Discharge 119
    Hydrograph 122

Wappinger Creek:
  At Wappinger Falls, Dutchess county 116
    Discharge 117
    Drainage 117
    Gauge readings 118

West Canada Creek:
  At Twin Rock Bridge, Oneida county 81
    Discharge 84
    Drainage areas 83
    Trenton Falls Dam, view, facing 82

West Branch Mohawk River:
  At West Branch, Oneida county 102
    Discharge 102
    Gauge readings 103
    Precipitation 103